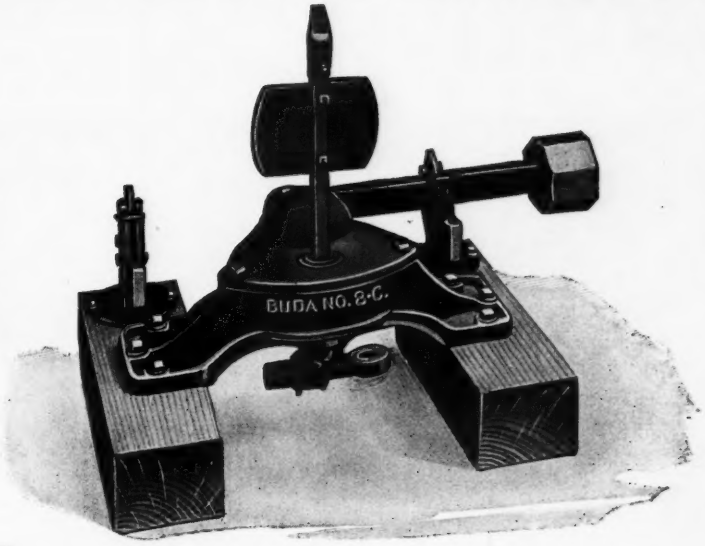
Railway Maintenance Engineer

Volume 12 | CHICAGO: Transportation Building NEW YORK: Woolworth Building | JULY, 1916 | CLEVELAND: Citizens' Building LONDON: Queen Anne's Chambers | Number

The Buda No. 8-C Switch Stand

The steel and malleable iron construction and the fact that all backlash is eliminated, are the best reasons we can offer for the distinctly different service of the Buda No. 8-C Switch Stand.



For Yard and Main Line Service

The quadrant fan gear and crank are made up in one piece. The lower turned portion of this part fits in a bored hole in the base of the stand and the shoulder bears against a faced shoulder on the base. The upper turned portion of this part fits in a bored hole in the cover. Therefore, this part, which changes the direction of the switch points, is rigidly supported at both top and bottom, so that there cannot possibly be any lost motion.

The target mast has no function to perform except to simply turn as the lever is thrown and indicate the position of the points.

The crank pin is adjustable so that any desired throw of the switch point can be obtained.

Nothing Can Be Damaged But the Crank Pin

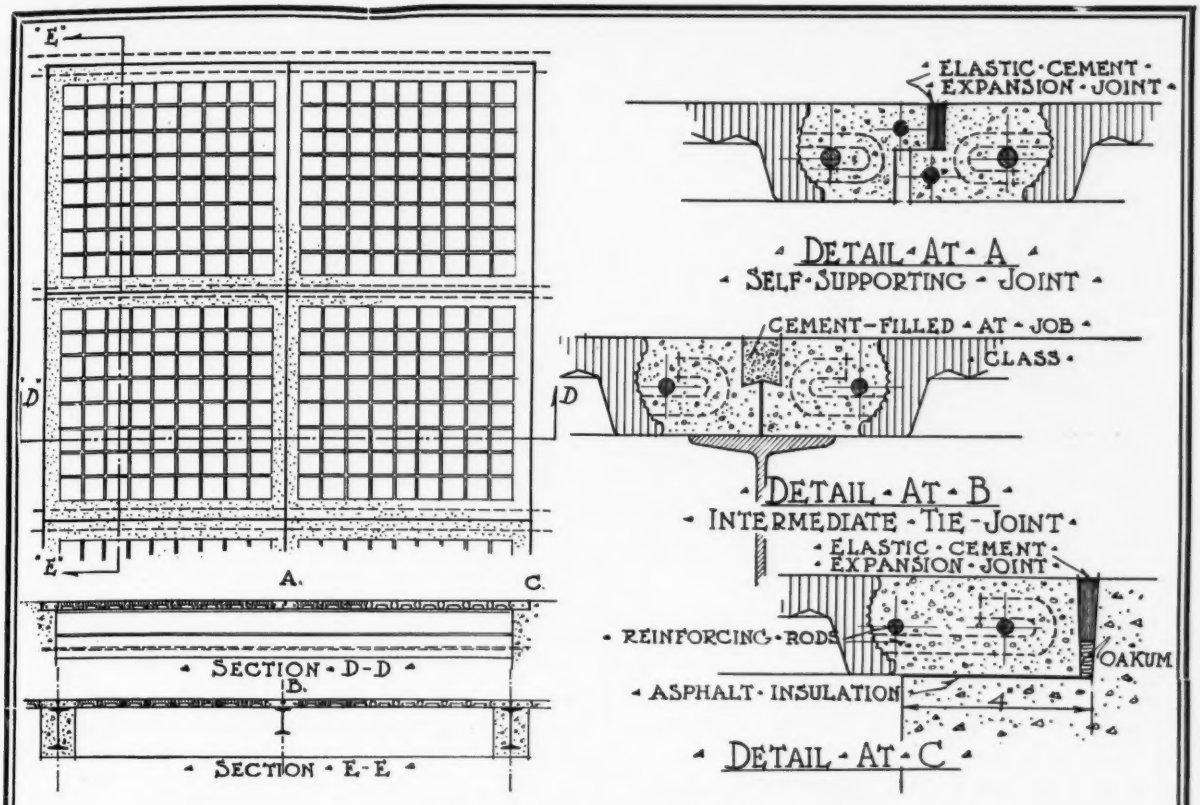
If the stand is run through with latches locked, the adjustable crank pin is broken—nothing else about the stand is damaged.
Furnished with or without locking latches.

Patented July 5, 1910

Write for further information.

THE BUDA COMPANY

NEW YORK **CHICAGO** **ST. LOUIS**



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for Vault Lights and Roof Lights

built to your specifications, exact size desired, and shipped complete within 15 days of order, with full instructions for setting and waterproofing.

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(with 4-inch units)

have an all-glass undersurface, are 2 in. thick, weigh 23 lbs. per sq. ft., and support a safe load of 300 lbs. per sq. ft. up to a span of 4 ft. 6 in. No painting or upkeep is needed.

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(with 6-inch units)

have an all-glass undersurface, are 1¾ in. thick, weigh 16 lbs. per sq. ft., support 70 lbs. per sq. ft. up to a span of 5 ft. No painting or upkeep is needed.

We have shipped them from New York to various parts of the United States and South America. In every case they have arrived in good condition and have exactly fitted the openings previously specified.

Complete detailed drawings of Keppler Panels, pre-assembled to order, will be sent upon request; also Keppler Bulletin 202. Use coupon below.

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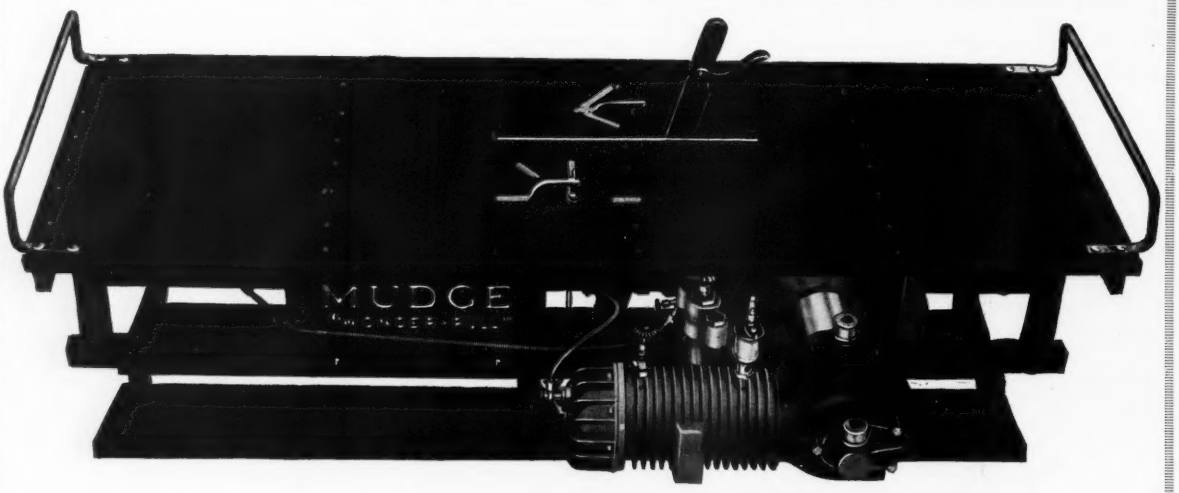

You bolt the old hand-car body under the Mudge "Wonder-Pull" and your section car is complete

Roadmasters Notify Foremen

Why have many roads notified their section foremen that all engines purchased for hand-cars must be mounted in the company shops?

It is not because this extra work and expense is welcome in the busy shop, but because maintenance men have come to realize that the average section foreman has but limited mechanical ability.

Lacking proper facilities on the line, he is not prepared for the task of building frame parts, locating, mounting and assembling coil, batteries, tank, control levers and engine. If he *must* do the work, chances are against his success, and proper application, as you know, is winning "a good half the battle."

The Answer

Doesn't this naturally lead you back again to the above picture of the Mudge section car top for hand-cars assembled complete with "Wonder-Pull" six-horse engine? Just to look it over gives you the pleasing thought that the car is just about built. And so it is. As a matter of fact, it is a car without wheels. The Wonder-Pull is a friend of the foreman.

This Must Be Done

Those two lower frame rails, you notice, that support the engine, cylinder and bearings, fit right over the center sills of the old hand-car after the gallows frame has been removed. Then six long bolts come up through cross sills and the two lower rails. Nuts on top. When nuts are tightened, car is turned on side, split pulley is placed on axle and lined with engine pulley.

Now the wide weather-proof belt is applied, laced, and the car is ready to do business. The foreman has not furnished a single item. He could not go wrong. It is a success.

No More Railroad Shop Work

When one hundred foremen on the same road purchase "Wonder-Pulls" every car is identically alike—in looks, in action and in every detail part. The necessity for sending car to shop no longer exists. This material expense and overhead is all avoided.

The work is all done by our expert motor car men, and we can guarantee results. We know just how the car is going to perform when the foreman gets it.

We welcome the responsibility of furnishing the equipment complete. We do not want to shift this responsibility to the railroad company or foremen by having them do a part of the most important work.

Here's What a B. & B. Supervisor says:

Replying to your recent letter in regard to the "Wonder Pull" equipments recently purchased:

These are used in the Bridge Department and were put in service February 17th. They have been in use almost every day, and for as hard work as a motor car could be put to on any road. Most every trip made is with a push car-trailer, loaded with tools and timbers.

We have kept a daily performance of each of the three cars, and as Foreman ——— has just handed me his report for the latter part of May, I will submit it to you: Days used, 16. Miles run, 212. Men riding, 103. Gasoline consumed, 10 gallons. Lubricating oil used, 6 pints. (This car carried trailer on almost every trip.) Cars carrying 6 to 7 men, without trailer, making about 33 miles per gallon gasoline. There is not one of these three cars that has had any repairs made in any way, or caused any delay. Always ready for their part of the work. There are a great number of different makes of motor engines used on our line by section gangs, and most every foreman that has seen the Mudge GQ-2 perform says that it is the simplest and best engine on the line; nothing to get out of order; in fact, it is the only gas engine I ever saw that can be kicked out of a snowdrift when it is 10 to 15 below zero and be ready to run. In conclusion, will say that cars have given perfect satisfaction and greater service than I expected of any motor car.

More To Be Told

There are a good many more interesting things for you to know about the Mudge "Wonder-Pull." We have not attempted to tell you about such things as its simplicity, reliability, capacity, light weight, low maintenance, where in service, how it works forward and reverse, how it is furnished with or without starting crank, and, best of all, the moderate price at which we are offering the equipment, both for cash and easy terms, for foremen.

Demands have been anticipated and for the present at least prompt shipment can be assured.

Write for further particulars to-day.

Mudge & Company

Railway Exchange, Chicago

Railway Maintenance Engineer

Volume 12 July, 1916 Number 7

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*)

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WE GUARANTEE that of this issue 5,200 copies were printed; that of these 5,200 copies, 4,035 were mailed to regular paid subscribers, 69 were mailed to advertisers, exchanges and correspondents, and 1,069 were provided for new subscribers, copies lost in the mails and office use.

The *Railway Maintenance Engineer* has applied for membership in the Audit Bureau of Circulations.

CONTENTS

Economical Use of Gasoline

While the great increase in the consumption of gasoline is a matter of common knowledge, few have considered the effect of this increase, as reflected in higher prices, on the cost of railway operation. A brief consideration will lead to a realization of its very general employment for a wide variety of purposes in railway work. The rapid increase in the adoption of motor cars and the transition from steam to gasoline-operated pumping plants and small power plants are examples of the growing use of this fuel. This has resulted in the demand for it on the railways increasing rapidly and with advancing prices, the total expenditure has increased still more rapidly. It is therefore important that the users of gasoline see that it is employed economically. The present conditions also furnish a strong incentive for the adoption of cheaper oils wherever conditions will permit.

The Small Passenger Station

During recent years the large passenger terminal has received much attention from railway men and the public in general, to the detriment of the smaller station, although, considering the number of people who use terminals of the two classes, the smaller structure is probably of equal importance with the larger. Until recently it was the common practice on most roads to build at outlying points, small frame stations, which were of sufficient size for the needs of the companies, but which had little or no claim to attractiveness of appearance. In view of the large amounts expanded to provide terminals of attractive design at the larger cities, this policy has become manifestly inconsistent. A number of roads are now giving closer attention to the smaller stations, and are designing structures primarily for utilitarian purposes, but also with regard to their attractiveness. As each station presents a problem in itself in design, in the selection of materials and in construction details, increased study and supervision are necessary, but the results fully compensate for this increased attention.

Reclamation of Scrap Materials

Because of the importance of the reclamation of way scrap, we desire to call attention to the contest on this subject which is now being conducted and to solicit the co-operation of students of the problem in order that the greatest amount of valuable information may be brought out. No field offers greater opportunity in proportion for economy on the average road to-day than the scrap pile. Much material is commonly sent in as scrap which is suitable for further use in its present condition. Other material unfit for further use as it is sent in, can be repaired and reclaimed at small cost, while still other materials which can be considered only as scrap, can be sorted in accordance with the market classifications in order to secure the highest prices. Further opportunities for economics exist in the methods of collecting and handling these large quantities of materials. As already announced, we are conducting a contest on The Reclamation of Maintenance of Way Scrap to include all phases of the problem from the assembling and collection of the material out on the line to its final disposal. Special attention will be given to papers describing methods actually in use and the results secured with detailed descriptions and cost figures. Photographs will also be valuable. Prizes of $25 and $15 will be paid for

the two best papers received, while all others accepted and published will be paid for at our regular space rates. All contributions should be sent to the Editor of the *Railway Maintenance Engineer,* Transportation Building, Chicago, and must be received not later than July 15 to be considered by the judges.

THE "EIGHT-HOUR DAY"

ONE of the biggest and most complicated of the many problems now facing the railways is that created by the demand of the organizations of trainmen and enginemen for an eight-hour basic day and time and one-half for overtime in all train and yard service, except passenger service. It is estimated by the managers that to accede to the proposals would increase their payrolls by about $100,000,000 a year. Such an important question as is raised by a demand of this magnitude, backed by a threat to strike unless the railroads comply, is naturally of great interest to all railroad men.

If the railroads should have to accede to the demands in the form in which they have been presented, the effect would be felt with especial force in work train service on construction and maintenance work, where the hours of employment of the train crews are necessarily long, but where their work is comparatively easy. Actual figures from the payroll of a large western road show that to pay the present day's wage for eight hours' work and a rate 50 per cent higher for the additional hours would increase the earnings of the work train crews by nearly 50 per cent. And this is in spite of the fact that this class of service is not subject to most of the conditions regarding which the brotherhoods complain in attempting to justify their demands, and that work train assignments are usually eagerly sought by the train employees in exercising their seniority rights.

As the expense of work trains is a very important item in both construction and maintenance work, an increase of nearly 50 per cent in the wages of the crews would add very materially to the expense of the upkeep and improvement of a railroad. The facts that it would be extremely impracticable to reduce the hours in work train service to eight hours, and that the employees now choose these runs because of the high pay that goes with the long hours, is one of the best indications that the purpose of the demands is to increase wages rather than to establish an eight-hour day.

The amount of the increases asked appears especially unreasonable when the present earnings of the train crews are contrasted with those of the other men concerned in maintenance work. The average wage of all the train employees, about $1,253 per year, not only shows an unjust discrepancy as compared with the average pay of a section foreman, about $765 a year, but even as compared with the technically trained engineers who are in charge of the work. The average locomotive engineer earns about $1,772 a year; firemen, $1,037; conductors, $1,533 and other trainmen, $1,023 a year. In work train service the wages considerably exceed these averages.

The controversy created by the demands of the trainmen's organizations is not one that concerns merely the men directly involved and the managements. To grant any large increase in wages to the class of railroad employees that have for many years been most successful in obtaining higher pay would render it even more difficult for the railroads to improve the condition of their other employes. The controversy is therefore of especial significance to the 80 per cent of railway men, most of whom receive considerably less pay than the train employees.

PROGRESS IN WATER SOFTENING

THE present situation regarding water treating plants is unusual. Few additional plants have been built in recent years, while a number of old plants have been abandoned. When this state of affairs was investigated two years ago by the water service committee of the American Railway Engineering Association, nothing was learned that would indicate any defect in the basic principles of water treatment. There was ample evidence, however, that the seeming failure of the water softeners had resulted almost entirely from neglect on the part of the railroads to provide a form of organization which would insure the proper operation and maintenance of the plants as well as the intelligent use of the treated water. A few cases were encountered where the facilities were of poor design or of inadequate capacity or where the installation was apparently ill-advised.

A common source of trouble is the failure to provide an adequate check on the treatment by a competent chemist. It cannot be expected that the pumpers who commonly operate these plants will fully appreciate the object of water treatment or that they will always follow instructions conscientiously. Difficulties have also arisen from divided authority. There are cases where the water softeners are operated by the mechanical department and maintained by the bridge and building forces, thus becoming a sort of step-child in which neither department takes any particular interest.

A refreshing contrast to such conditions is seen in the results recently obtained on the Missouri Pacific, described elsewhere in this issue, with water-softening plants built some 10 years ago. The reasons for success in this case are obvious. The plants were installed under the direction of a superintendent of water service whose sole interest lay in the production of an adequate supply of boiler water of good quality. Having obtained the necessary appropriation for water-softening plants, he and his department were responsible for an adequate return on the investment. The operation of the plants was not, as in some cases, intrusted to the tender mercies of some other officer, who might or might not be in sympathy with water treatment. It is not to be inferred that this is an isolated case of successful water treatment, for similar measures have produced good results on other roads. While reports like the one appearing in this issue are rather rare at this time, repeated demonstrations of the advantages to be secured were given considerable publicity some years ago. At the present time many roads are suffering from the effects of bad boiler waters where it would seem that a thorough study of the conditions should demonstrate the justifiability of a considerable investment in water-treating plants. For the benefit of those who must make the necessary investigations, it is to be hoped that more new data will be made available showing results secured with existing installations.

Few roads are giving water service the attention it deserves. As a result, uneconomical practices have been allowed to develop. This condition has risen from lack of concentrated attention being given to this subject. If the maintenance of bridges was left to a roadmaster as incidental to his main duty of supervising the track as the water service on most roads is left to the supervisor of bridges, similar shortcomings would soon develop here.

The elimination of encrusting matter from the water is not the only means of economy, for while the quality of the water on the Missouri Pacific was greatly improved, the cost of pumping it was reduced at the same time. A recent comparison of the cost of providing water on the basis of 1,000 ton miles, on nine western roads, showed a

variation from 3 1-3 cents to 7 cents, the lowest figure being for a road with a well-organized water service department operating in the same general territory as the road with the highest figure. Local conditions alone do not account for the fact that the water cost twice as much on one road as on the other. The installation of economical pumping units, the use of the most economical fuels and the proper supervision of pumpers all enter into these costs. A third opportunity for economy arises from the maintenance of water stations. While the amount spent at any individual outlying station may be relatively small, when a railway system, as a whole, is considered, a large amount of money is expended yearly in the maintenance of these stations. With the cost of operation and maintenance of the water stations on the average railroad of this country amounting to almost $100 per mile of line annually, it would seem evident that the average railway could well afford to organize a special department with direct supervision over this service.

THE USE OF WOOD

IN comparison with wood used for building purposes, steel is a comparatively young structural material. The wonderful development of its use in bridges and buildings, fostered during an age of scientific endeavor, has resulted quite naturally in delegating the arrangement of the structural steel pieces to form columns, girders and trusses to skilled designers thoroughly trained in the mathematics of design. This accounts also for the strict application of the results of tests showing the physical qualities of the material. This policy is carried out even to the most careful scientific study of the minutest details of the work. With wood the situation is entirely different. The carpenters' trade is as old as civilization, and practices developed through the ages have been passed down to the present with little change. It is true that in the design of most trusses, and of pile and timber trestles and other large timber structures of a like character, thorough use is made of the best information available regarding the strength of timber, but in minor structures and almost entirely in building construction the smaller details are left to the carpenter. While trade knowledge does take some account of stress action, it is frequently wide of the mark, for instance, in bearing across the grain. The selection and use of wood has been the subject of research by various laboratories throughout the country for some time, and much valuable information is being disseminated not only as to the strength of wood, and the methods of preservation, but also regarding the general application of wood to the various uses in a manner that will insure the longest life. The importance of ventilation, drainage and security against infection from decayed pieces has been given special attention, and evidences of the rapid deterioration of timber structures from improper practices in this respect are frequently brought to light. As an example of the movement for better education along these lines attention may be called to the course of lectures recently announced by the University of Wisconsin to be given by the staff of the Forest Products Laboratory. Railroads will continue for many years to use timber exclusively for many purposes, including buildings, platforms, signs, gates, etc., for timber has certain qualities which make it preferable for many uses over any other material, irrespective of price, but with the increasing cost of lumber, it is essential to secure full returns for the money expended in its purchase and it becomes more and more necessary that its use be subjected to scientific supervision. When the knowledge of timber becomes universal, many of the present destructive practices will disappear.

LETTERS TO THE EDITOR

CO-OPERATION BETWEEN DEPARTMENTS

HAILEYVILLE, OKLA.

TO THE EDITOR:

In spite of all that has been written and said regarding the importance of maintenance of way work, it is still evident that the transportation department, on which the maintenance of way department must rely for much assistance in the handling of materials, frequently fails to give it the support required. When a roadmaster desires a work train he calls upon the superintendent, who, if he approves, may give him the train with a small engine. If he does not think that a train is necessary the superintendent will probably tell the roadmaster to ask the chief despatcher to arrange for a passing train to unload the material. At the same time the chief despatcher will probably hold instructions from the superintendent that local trains, or those moving in the direction of prevailing tonnage, must not be used for this work. After considerable delay the chief despatcher will probably be able to arrange to do the work while the section gangs will have lost enough time meeting other trains to have more than paid for the cost of a special work train.

Frequently when a train is promised it will be arranged for the local crew to do the work on Sunday, and the roadmaster is asked to have his forces lined up ready to begin work at seven o'clock. In the meantime the local train crew is delayed in reaching its terminal on Saturday and its rest period does not expire until late Sunday forenoon. When ready the train will probably be further delayed in getting out of the yard by the necessity of allowing passenger or other trains to pass. As a result it does not get out on the line ready to distribute the material until noon. Late in the afternoon the conductor advises the despatcher that he has unloaded a few cars of material and has a considerable number remaining. He will then probably be instructed to remain as long as the men will work and unload as many more cars as possible. Without previous preparation for night work insufficient lanterns are available, the work is delayed and possibly injuries are incurred. In any event, only about one-third of a day's work is done at a cost three times that under normal conditions.

Closer co-operation between the transportation and the maintenance of way departments will eliminate such conditions. It is not reasonable for the transportation department to expect a roadmaster to require his men to work on Sunday (frequently at time and one-half rates), when the work can be arranged more conveniently during the week. There is no economy in postponing work from day to day for a better opportunity. Slow orders are frequently maintained over bridges or soft spots in track for weeks at a time because of delay in unloading the required materials. The transportation department maintains correctly that all trains should be run with full tonnage and that such trains earn the revenue. This is true, but it is equally important to keep the cost of the maintenance of way down, as the money saved in both departments goes into the same fund. Train despatchers can assist materially in the handling of material by watching their trains closely and knowing where supplies are to be unloaded. They can then arrange to do the work economically without interfering materially with the handling of their traffic.

J. L. COSS.

RAIL EXPANSION AND BREAKAGE

COLORADO CITY, COLO.

TO THE EDITOR:

The writer has for a number of years battled with the track problem on one of the most difficult mountain railroads of the country, made up principally of 3 and 4 per cent grades and 16-deg. curves. It has been his observation that the failure to maintain proper allowance for the expansion and contraction of each individual rail is responsible for a large percentage of the rail breakages. It is a well known fact that a curve, no matter how light, will, in a measure, act as an anchor against the running or dragging of the rails and that the heavier the curvature is the more solid is the anchor. For illustration: we have one mile of tangent track between two 16-deg. curves located on a grade of 3 per cent. A close inspection of the track discloses the fact that, for about one-half of the distance, starting with the curve at the lower point, the expansion is closed, while the joints for the other half are open as much as the conditions will permit. This is evidence that heavy trains descending the grade with the brakes constantly in use, drag the rails against the anchor formed by the curve at the lower point. The curve at the higher point acts also as an anchor against the longitudinal movement of the rails thereon.

Here we have two equally dangerous conditions. During the summer months the hot sun strikes this track and the rails must expand, while in the winter they must contract. The great difference in temperature between the night and the day in this locality, as in many others, causes rails to expand and contract to a considerable extent each 24 hr. With these conditions the stress in the rail during the heat of the day, with no allowance for expansion, is enormous, often shoving the track out on the curves and requiring the removal of a portion of a rail before the curve can again be lined. However, allowing that the track on the curve remains in place, imagine the stress created in it by the expansion of the metal with no allowance made for it. Then picture the movement of this rail under a large locomotive hauling a train of heavily loaded cars. Is it any wonder an occasional rail gives way under this strain?

We have a similar condition over the other one-half of this track. In severely cold weather the expansion is open; each individual rail is tugging at the joint; there is no allowance for contraction and we find the same stress here as outlined above—only in one instance it is created by the expansion, while in the other it is caused by contraction that greatly reduces our rail efficiency. It has been our observation that the rail breakage, of which we have considerable, usually occurs in the summer months when expansion has closed the joints and during the winter months when rail joints are open sufficiently to prevent further contraction.

Those who were in charge of track maintenance prior to the advent of the power brake for train control will readily recall that in those days accidents chargeable to rail breakage were less frequent than to-day. To be sure, there are many who are all too ready to place the responsibility on the rail manufacturer. We frequently hear the remark, "If we could only get the quality of steel that we furnished in years gone by we would have less trouble." In our opinion, this is a great injustice to the present manufacturers of steel rails. Prior to the advent of the power brake the running or dragging of rails to any considerable extent was unknown, for the very good reason that the old method of stopping a train by the use of hand brakes was very much slower and a sufficient number of brakes could not be applied at one time to cause the dragging of the rail, thereby destroying the allowance for expansion and contraction.

When we devise means whereby we can maintain this allowance, and then exercise proper care in the laying of the rail so that each individual rail will act separately, expanding and contracting within itself, we will have solved the problem of 100 per cent track efficiency by eliminating the greater per cent of the rail breakage, the churning of an occasional cross tie in the ballast, thereby causing an uneven track surface, and the kinking of an individual rail or the throwing out of line of an entire section of track.

M. L. PHELPS,
Superintendent, Colorado Midland.

NEW BOOKS

Proceedings of the American Wood-Preservers' Association, 432 pages, 6 in. by 9 in. Illustrated. Bound in cloth. Published by the American Wood-Preservers' Association, F. J. Angier, secretary-treasurer, Mt. Royal Station, Baltimore, Md. Price, cloth, $3.50; paper, $2.50.

This is a complete account of the twelfth annual convention of the American Wood Preservers' Association, which was held in Chicago January 18-20, 1916. A most interesting and valuable feature of this book is the statistical section which gives detailed data as to the consumption of wood preservatives and the amount of timber treated, itemized as to kind, uses and territorial distribution. It also gives a list of the timber treating plants in operation, a list of patents referring to wood preservation and an extensive bibliography of wood boring crustaceans. Extensive records are also given of the service of railway cross-ties and wood block flooring.

Modern Framed Structures. By J. B. Johnson, C. W. Bryan and F. E. Turneaure. Part Three, Design, rewritten by F. E. Turneaure, dean of the College of Engineering, University of Wisconsin, and W. S. Kinne, associate professor of structural engineering, University of Wisconsin. 486 pages. Illustrated, 6 in. by 9 in. Bound in cloth. Published by John Wiley & Sons, New York. Price $4.00.

This is the third of a series of three volumes constituting a complete rewriting of the well-known "Modern Framed Structures," published in 1893. Volume One of the new edition has the title, "Simple Structures," and volume Two, "Statistically Indeterminate Structures and Secondary Stresses." This volume is a revision of those chapters of the original book devoted to the subject of detailed design and unit stresses, but contains much material that was not given in the earlier edition. There is no better measure of the progress of bridge design in the last 20 years than that to be obtained by a careful comparison of this book with the original edition in the treatment of secondary stresses, impact, provision for future loading, etc. Although there is no actual physical sub-division in the book, it is in reality composed of two distinct parts. One is an analytical exposition, comprising the several chapters on stresses, and those on riveted joints, plate girder bridges and truss bridges. The other part is a manual for the student and designer and consists of the chapters containing complete outlines of the design of a plate girder bridge, pin-connected and riveted truss spans, a highway bridge and a roof truss. An insert plate containing a drawing of the structure under consideration accompanies each one of these chapters. Forty-six pages of the book are devoted to appendices. Appendix A contains the specifications for steel railway bridges of the American Railway Engineering Association, Appendix B some tables of detailing information, and Appendix C a treatment of the subject of bending in planes at oblique angles with the principal axes of the structural members.

SEASONS WORK SUMMARIZED

"Just a little sunshine, hel-av-alot of rain,
More than 40 washouts; winter time again."

WATER TREATMENT ON THE MISSOURI PACIFIC

Operation of Softening Plants Has Resulted in Material Reductions in Boiler Repairs and Engine Failures

Boiler Scale from Untreated Water

DURING 1915, 604,470,000 gal. of water were treated by softening plants on the Missouri Pacific, removing from this water 1,816,837 lb. of scale-forming solids. There are 33 water-treating plants in operation on the main and branch lines between St. Louis, Mo., and Pueblo, Colo., which have been in service from 5 to 10 years, and represent a total investment of $70,450. On the basis of a saving of 7 cents per pound for incrusting matter kept from entering the engine boilers, as outlined by the water service committee of the American Railway Engineering Association in 1914, the total saving to the railway from the removal of this scaling material amounted to $127,171. From this must be deducted $26,717 for the cost of treatment, including additional labor, chemicals, maintenance, and 10 per cent to cover interest and depreciation in the treating facilities, leaving a net saving of $100,454.

In arriving at the figure of 7 cents per pound for incrusting matter removed, the committee realized that the benefits derived from water treatment are numerous, but usually of an intangible nature. However, values were placed on four of them—loss of fuel resulting from the insulating effect of the scale, renewal of flues, repair work on flues and boilers in the roundhouse, and the loss of engine time during repairs. On account of its intangible nature and the difference in the relation on the various districts, the reduction of engine failures was not considered in determining the above figure. It has been found that the average cost per engine failure, exclusive of labor and material for repairs, amounts to $17, and on one division the engine failures resulting from boiler troubles were cut down over 1,000 per year by the treatment of the water, thereby giving a saving in this one item alone of $17,000. From this it is seen that 7 cents is very conservative.

The accompanying table shows the character and source of supply, the amount of water treated, the amount of incrustants removed, the cost of plant, and the cost of operaion of the 33 plants during the year 1915. The amount of scale removed was derived by checking the raw water hardness against the incrusting solids still remaining in the water after treatment.

Of the 33 plants on the Missouri Pacific, 16 are of the intermittent, and 17 of the continuous type of various designs. The majority were installed by company forces under the supervision of the superintendent of water service, and each one was designed to fit the individual station with a view to providing for the maximum use of the existing facilities. Material changes have been necessary in some of the first plants installed, but all have paid for themselves many times over, and after several years of service are still yielding 142.5 per cent on the investment.

Many of the stations were equipped for softening the water at a remarkably small expense. Intermittent plants were provided by placing a second tank beside the old one and equipping each with air-agitating pipes, each serving alternately as a storage and a treating tank. Where penstocks are used, the pumper manipulates the valves into the discharge line so that the proper tank is connected at all times. Where engines take water direct from the tank, each one is equipped with a spout, the operator placing a white flag on the tank from which water is to be taken.

The most inexpensive plant is built inside a roadside tank and consists of a shallow box placed under the roof of the tank to act as a mixing basin for the chemicals and water. The mixture then flows down through a large discharge pipe to the bottom of a small inside tank about 10 or 12 ft. in diameter, from which it is discharged at the top through an 18-in. excelsior filter into the tank proper, which serves as a storage compartment. At small stations where the rate of pumping does not exceed 4,000 or 5,000 gal. per hour, this plant has proven very successful and economical, but where the rate of upward flow of the water requires it to pass the filter in less than three hours, there is a strong tendency for the sludge to be carried over, resulting in milky water, which induces foaming. The chemicals are put in with a small simple displacement plunger pump and the mixture is regulated by the chemist's instructions of so many inches from the chemical vat per foot of water in the storage tank.

A continuous plant for larger capacities has given very good service. In this case the chemicals and water mix in a small box at the top of the tank, and because of the large volume of water going through a small space very thorough agitation is secured. The mixture then goes down through an inside steel tube 6 ft. in

diameter, which quiets all eddies and comes up in an outside storage tank with no filter. By proper treatment of the water a good, clear effluent is obtained at the height of 18 ft. in a tank 30 ft. in diameter, pumping at the rate of 25,000 gal. per hour. The amount of chemicals is regulated and supplied by a small plunger pump, as in the other style of plant.

The water-treating plants are operated by pumpmen under the supervision of the division water service fore-

Station	Source of Supply	Raw Water Hardness in Grams Per Gal.	Annual Consumption in Gallons	Pounds of Scale Removed	Original Cost of Treating Facilities	Total Additional Cost for Treatment	Total Saving
Auburn, Neb.	Well	30	25,867,950	88,330	$ 7,500	$ 2,156	$ 5,973
Berlin, Neb.	Well	28	3,170,400	10,465	1,500	243	732
Brownell, Kan.	Well	12.5	15,990,000	23,985	750	296	1,679
Bushton, Kan.	Well	16.0	11,640,755	20,370	750	234	1,425
Caney, Kan.	Creek	12 - 28	3,648,000	7,276	1,500	424	509
Cedarvale, Kan.	Creek	12 - 18	3,316,600	4,975	750	295	348
Concordia, Kan.	Well	35.0	10,164,300	40,738	2,300	545	2,852
Downs, Kan.	Well	16.0	11,137,000	16,707	6,500	824	1,170
Eads, Colo.	Well	23.0	8,470,000	15,246	2,000	385	1,067
Greenleaf, Kan.	Well	24 - 40	10,593,387	37,076	3,000	801	2,596
Gypsum City, Kan.	Creek	12 - 40	12,194,000	36,582	3,000	695	2,562
Haswell, Colo.	Well	27.0	13,270,000	46,445	2,000	550	3,251
Herington, Kan.	Creek	20 - 65	8,149,000	40,745	3,000	882	2,852
Hoisington, Kan.	Well	16 - 18	61,940,000	123,880	5,000	1,235	8,672
Holton, Kan.	Well	35.0	3,318,030	14,931	2,000	448	1,045
Jamestown, Kan.	Well	18 - 22	7,245,220	14,490	750	145	1,014
La Platte, Neb.	Creek	10 - 19	13,655,000	31,406	750	207	2,198
Le Roy, Kan.	Creek	10 - 20	18,027,000	27,040	3,000	620	1,893
Lenora, Kan.	Well	20.0	2,746,000	5,492	350	102	384
Marquette, Kan.	Well	18 - 30	21,581,450	64,744	750	557	4,532
Oak Mills, Kan.	Well	27.5	5,977,500	13,150	1,500	393	921
Olcott, Kan.	Well	18.0	1,963,000	3,926	600	153	275
Ordway, Colo.	Reservoir	25 - 45	18,167,000	90,835	3,000	1,215	6,368
Pueblo, Colo.	Well	18 - 30	31,800,000	95,400	2,500	942	6,678
Roper, Kan.	Creek	10 - 18	9,490,800	14,236	500	227	996
Scott City, Kan.	Well	11.5	19,855,000	19,855	2,000	580	1,390
Sedalia, Mo.	Well	18.0	18,250,000	36,500	1,500	234	2,555
Seneca, Kan.	Well	22.0	5,098,800	13,257	2,000	409	928
Union, Neb.	Creek	6 - 18	21,405,000	21,405	2,000	500	1,498
Weeping Water, Neb.	Creek	6 - 18	8,376,400	8,376	2,000	374	586
Wichita, Kan.	Well	50.0	66,158,000	330,790	750	3,237	23,155
Winfield, Kan.	Creek	12 - 25	4,501,500	9,002	1,500	397	630
Kansas City, Mo.	Well City Water	35.0 8 - 22	127,310,000	492,105	10,000	6,421	34,447
	TOTALS		604,468,087	1,816,937	$70,450	$26,717	$127,171

CONDITIONS AT THE TREATING PLANTS

man. The treatment is regulated by a chemist stationed at Kansas City, the most central location. Samples of both the raw and treated water are sent to him from each plant twice a week. Formulæ are changed and any failures are investigated by him, and he is directly responsible for the results secured. Any corrections or changes found necessary are made by the division forces. Reports of the semi-weekly tests are furnished the general and division offices. A content of not more than 6 grains of incrusting solids per gallon in the treated water has been made a standard and any failure to meet this requires an investigation and explanation.

The treatment in general is gaged by the direct effect on the locomotive boilers. During his inspection trips the chemist consults the master mechanic, foremen and head boilermakers at the engine terminals as to the results obtained and checks leaky failures through daily reports. For many points where a softening plant will be located eventually on account of the hardness of the water, the scaling effect is overcome to a large extent by over-treatment at the nearest adjacent treating plant. Tests of the water taken from engine boilers on the various districts are frequently made and the treatment is adjusted as far as possible to give an excess of caustic alkalinity from sodium hydrate in the boilers at all times. Where it has been impossible to do this with the present treating facilities, excellent success has been obtained by the introduction of soda ash direct into the engine boilers through the washout holes after each washout, in amounts determined by the chemist. On account of the large amount of sludge and mud formed in the boilers, foaming conditions result, but this has been kept at a minimum and no serious trouble has been experienced. An anti-foaming compound prepared by the company chemist is used to take care of this feature. Before soda ash was used in this manner the engine failures on one division from boiler troubles were 19.1 per 100,000 engine miles, but they were reduced to 9.1 in 1915, when the soda ash treatment was in effect. Only five failures due to foaming occurred during the same year, a lack of compound being responsible for three of the five. Records show that continuous improvement is being made with the increased familiarity in handling the changed conditions.

From the figures shown it is not difficult to determine the advantages secured. The life of flues has been increased from 50 to 300 per cent. Engine failures on one division have been decreased from 1,435 in 1910 to 202 in 1915, resulting almost entirely from the decrease in boiler failures in consequence of the use of soda ash and treated water. On the same division the boilermaker force has been reduced from 17 to 7 at the terminal roundhouse, a saving of $15,000 per year in this item alone.

At the Sedalia, Mo., power plant, where the water is treated for five Babcock and Wilcox double-deck water tube boilers of 275 hp. each, 715 of the 840 four-inch tubes have been in continuous service for the past eleven years on treated water. On account of the shortage of boiler capacity and the unavoidable heavy duty, there has been insufficient time to shut down these boilers for washing out and two of them ran for five years between washouts, at the end of which time the scale on the tubes was less than 1-16 in. thick. With the use of the raw water, tube failures were frequent and the scale heavy.

The photographs at the head of this article show some samples of boiler scale, illustrating the difference between treated and untreated water. The one at the left shows a piece of scale 1½ in. thick, taken from a front flue sheet brace after 10 months' service. The one in the center shows a sample of sulphate scale ¼ in. thick, which put a boiler out of commission after three months' service. The one at the right shows a specimen of scale

SCALE FROM TREATED WATER

entirely clogging up the space between boiler flues after 8 months' service. The other photograph shows small fragments taken from locomotive boiler tubes after two years' service on the same district after the installation of treating plants and use of treated water. The pieces are less than 1-16 in. thick.

Over 5,000,000 telegrams and 3,000,000 letters are transmitted by the railways annually in tracing freight, involving an expense to the roads of over $100,000.

SAWING BATTERED RELAYING RAIL

A Discussion of the Advisability of This Practice and a Description of a Mill Recently Completed

THE sawing of rail released from main tracks to remove the battered ends and thereby improve its riding qualities, before relaying it in secondary lines, is practiced on a number of roads. On others it is not considered practical. For this reason we present below a discussion of this practice as worked out on a road which has long followed this practice and also a description of a mill recently completed on a western road.

THE RECLAMATION OF OLD RAILS

By JOHN REINEHR

Foreman of Rail Mill, Chicago, Milwaukee & St. Paul, Savanna, Ill.

The value of scrap relative to that of serviceable second-hand rail is the determining factor in deciding whether old rails are worth reclaiming. It is fair to assume that the value of second-hand serviceable rail removed from the track is at least two-thirds that of new rail (assuming an average for all rail replaced by new and second-hand rail on a large system annually), or approximately $21 per ton.

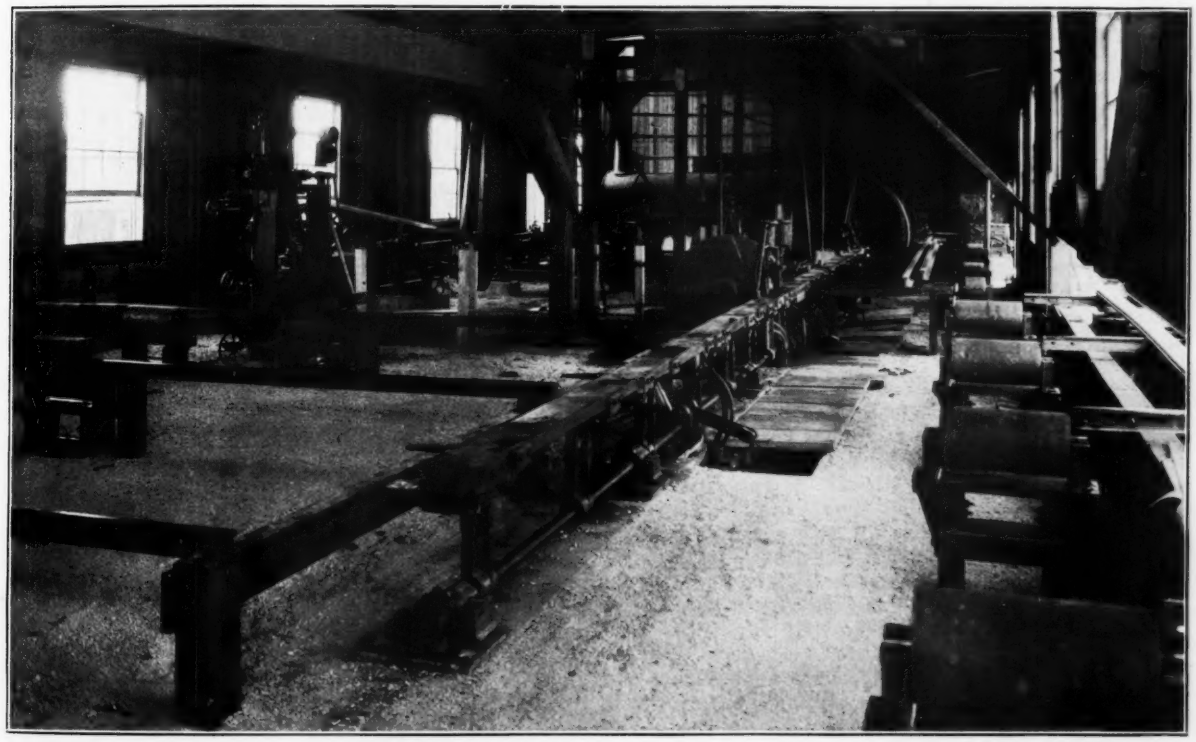
While scrap value is at present at a fair figure, for a number of years prior to August, 1915, it did not average above $12 per ton, and whatever rails have been reclaimed from scrap through means of conservation and have been made serviceable, have gained in value the difference between $12 and $21 per ton.

No road wants to sell serviceable rails as scrap, and all of them do reuse selected second-hand rails in patchwork or in the relaying of branches without reclaiming other than sorting. This is likely to be more profitable than selling the second-hand rails, but without straightening and sawing off the ends of battered rails, or those with worn fishing, results in the track are not satisfactory, and the second or third service life is materially reduced.

It is a safe assumption that during any service period, 10 per cent of the rails become in such condition that they cannot be relaid without sawing, or cannot be sold for relayers, owing to badly battered or broken ends, or worn fishing. Without means for reclaiming, such rails would have to be sold as scrap.

Assume a case of the relaying of 100 miles of 75-lb. rail:

Total rails recovered	11,800 tons
Rails fit for relaying	10,620 tons
Rails fit only for scrap without sawing	1,180 tons



INTERIOR VIEW OF NEW CHICAGO & EASTERN ILLINOIS RAIL MILL

Cost of sawing 1,180 tons at $0.70	$ 826
Rails recovered from 1,180 tons sawed:	
Scrap (7 per cent), 83 tons at $12	996
Serviceable (93 per cent), 1,097 tons at $21	23,037
Total value recovered	$24,033
Value of 1,180 tons of scrap at $12	13,160
Gross gain	$10,873
Less the cost of straightening, sawing, drilling and reloading the entire 11,800 tons at $0.70 per ton	8 260
Net demonstrable profit from the whole operation	$ 2,613

*Presented before the convention of the Railway Storekeepers' Association, Detroit, Mich., May 15-17, 1916.

There is an additional value in rails sawed over those relayed without sawing in that they make better track, more permanent joints and will wear materially longer, but there are no data available from which this value could be estimated or demonstrated in dollars and cents.

The foregoing is a fair demonstration of the value of reclaiming rails. Because of the great difference between the value of scrap and serviceable rails, the salvage is very large, and a small recovery in tonnage compensates for a good deal of handling.

A considerable portion of the sawed rails, depending upon local conditions, when properly graded, sorted, and equipped with well-fitting joints, will make as good track as new rails of equal length and are fit to lay anywhere within their section limits. The poorer grades can be used on branch lines and side tracks. The ultimate recovery from the redistribution will, of course, be scrap and must be sold. The probable effect of dumping second-hand rails on the market in large quantities, either as scrap or relayers, upon the price of new, second-hand, or scrap rails is a factor to be considered.

The most economical means for conserving the rails on a system to the fullest extent is to have a central point for storing and handling, or, in the case of a great distance between extreme terminals, several points to minimize the transportation cost. This central point should have sufficient storage space and be provided with tracks, track scales, skidways, overhead runways on which are mounted hoists (either pneumatic or electric), and a 25-ton locomotive crane for yard service, for use in unloading, sorting, piling and reloading rails. It should be equipped with a plant consisting of a rail straightening machine, a friction saw, drill presses and suitable skidways and rollers.

To secure the greatest economy, sufficient storage space, tracks, and mechanical handling facilities are essential to permit sorting on cars, so that material may be permanently placed for storage, re-shipment, or sawing as desired, directly off the cars on which it is received. The rails requiring sawing should go into the plant, and, with a continuous forward movement, should be straightened, classified, sawed, drilled and put in the stock piles for which they are intended, ready for shipment on requisition.

Proper classifying and sorting are of much value in getting good track service out of sawed rails. In the plant under the writer's jurisdiction 85-lb. rails and heavier are sorted into six different grades—main track rail, No. 1 second quality rail, second quality rail, No. 1 side track rail, side track rail and curve-worn main track rail. Sections under 85 lb. are graded—main track rail, second quality rail and side track rail.

On all main track the rails are sorted and piled in accordance with a gage number obtained by calipering the depth or thickness of the rail head. The rails piled together are of nearly uniform thickness of head and make good riding track. The main track rails are of practically full section and free from other than ordinary surface wear or distortion. The second quality rails are as substantial and safe as are the main track rails, but are not of such uniform and even surface, as they may be slightly curve worn, or overflowed, or of slightly uneven surface. The side track rails are badly worn or overflowed, the No. 1 being the least worn or overflowed. The curve-worn main track rails are outside curve rails worn not to exceed 7/16 in. at the top. The gage is applied to them and they are numbered and piled, each number by itself, and so shipped on requisition. They are used on branch line main tracks and make a good substitute for frictionless rail on the inside of curves.

In connection with the plant, it is essential to have facilities for handling and sorting joint fastenings and tie plates. While the greater portion of the second-hand fastenings recovered at this time is of very inferior quality, judicious sorting will produce many joints in first-class condition, and enough somewhat inferior joints to satisfy all demands for all minor purposes, as on side tracks. Full joint fastenings for all rails furnished from this plant should accompany the rails except on large orders for main track rail, where new joint fastenings are to be applied, in which case it is probably economical to furnish the joints direct from the mill, to the point where rails are to be laid.

Second-hand tie plates recovered from track should be handled at this plant. They should be sorted for rail section and condition and be properly piled to permit ready checking of the stock. A suitable punch and shears will permit the reclaiming of the plates from obsolete stock, or their repunching for other rails than those they were originally intended for. A drop hammer operated by compressed air, mounted over a suitable anvil and die, will permit the rapid straightening of tie plates bent in service.

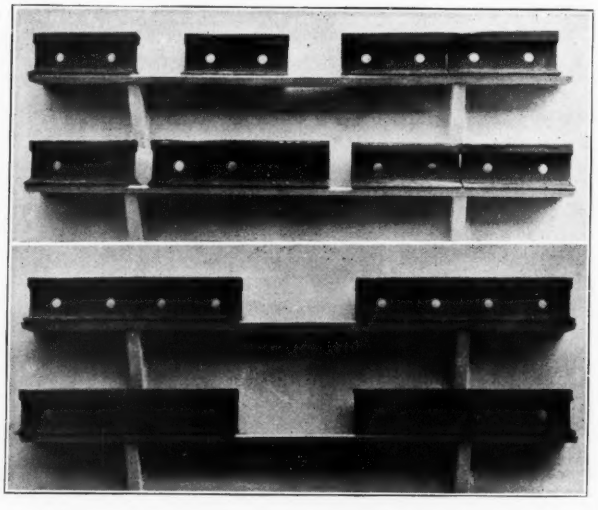
A PLANT FOR SAWING RELAY RAIL

By W. H. Hauser

Mechanical Engineer, Chicago & Eastern Illinois

The sawing of relay rail by the hot or friction saw is by no means a new operation. Work of this kind was performed in past years when wrought iron rail was used and when the angle bar bolt holes could be punched with the standard heavy-duty punch. Plants for sawing rail, however, are not so numerous but that an explanation of the work performed and an explanation of the results obtained may be of interest to men in maintenance of way service.

The Chicago & Eastern Illinois has just completed a very compact and complete plant at Danville, Ill., for the sawing of relay rail. Rail taken up and intended for re-



Unsawed and Sawed Rails

lay purposes is shipped to this plant, where bent or twisted rail is straightened by a hydraulic press, worn or battered ends are sawed off, new angle bar holes are drilled and the reworked rails are reloaded and shipped to the division on which they are to be relaid or are placed in the storage yard.

The two accompanying photographs show the difference in the results obtained from cut and uncut relay

rail. These photographs are made from the short ends of rails cut at the plant. The first photograph shows several groups of battered ends singly and matched together as would probably be the case were the old rail relaid as it came from the track. Some sorting would be possible, but the best that could be expected would be battered, chipped or splintered ends, poor joints, fins on the ends, elongated bolt holes and irregularity in rail connections. Such rail if relaid without being sawed would be difficult to maintain and with the best of maintenance would hardly give good results in service. The second photograph shows these rails reversed; that is, bringing the sawed ends together. The difference is very apparent.

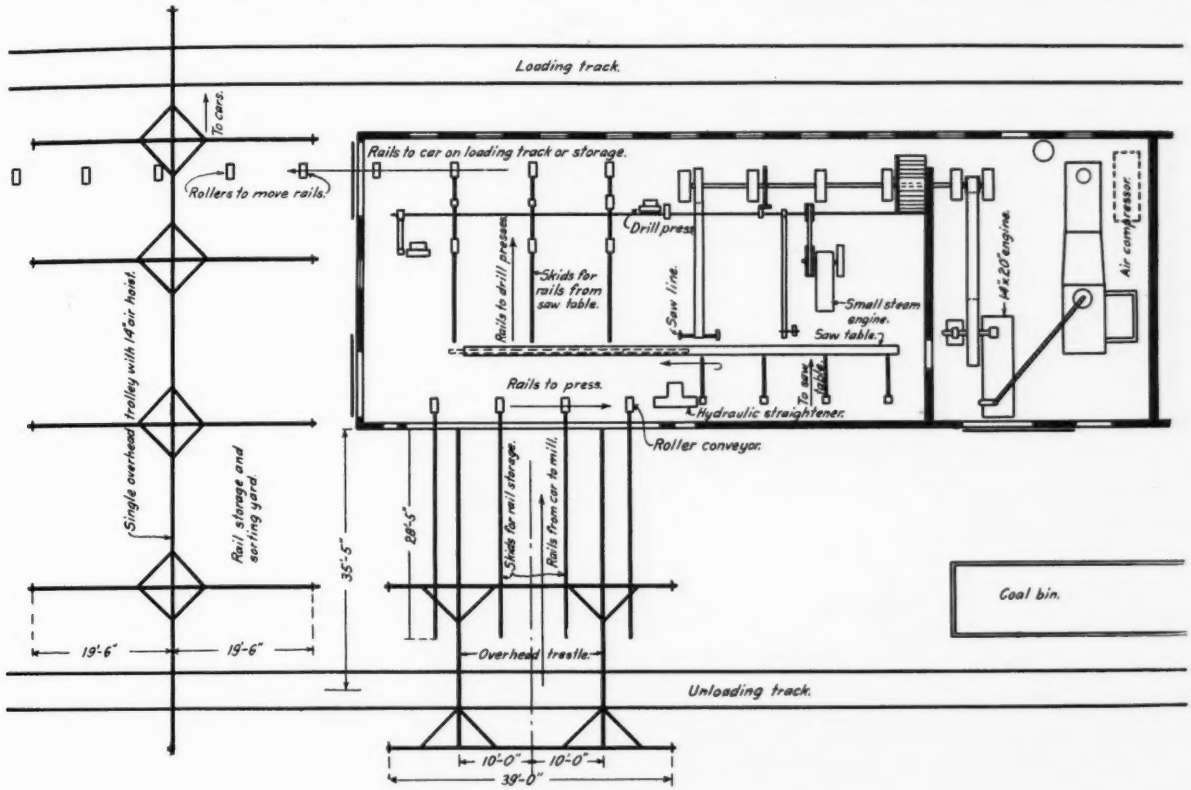
In sawing a varying amount of fin is left on the sawed end of the rail, which is chipped off by men equipped with light air hammers, who also clean the head of the rail of any bent or rough pieces which might interfere with the application of angle bars.

After leaving the drill presses the rail is inspected and graded by means of a gage which measures the wear to 1-32 in. This gage is slipped over the head of a rail and the wear observed. Rails showing 1-32 in. of wear are marked one, those showing 2-32 in. are marked two, and so on. A gage is provided for each weight of rail.

After grading, the rail is moved out of the building by means of a roller conveyor and loaded on flat cars for shipment, or placed in the storage yard. The storage yard is provided with an overhead air hoist for placing the rails in the proper piles, according to grade. A layout of the plant and yard is shown in the accompanying drawing.

The rails are delivered to the plant on flat cars and are unloaded and placed on the receiving tracks, accommodating 400 to 500 rails, by means of a double air hoist located over the track. The rails are skidded from the tracks onto a 24-in. roller conveyor in the building. They are passed through a hydraulic press and straightened of all kinks or bends. From the conveyor the rails are skidded to a storage rack and from this rack to the saw table.

The operations necessary in the sawing are controlled by one man standing back of, and to the left of the saw. By means of a simple system of levers and with air clamps and cylinders and a belt-driven roller rail feed he moves the rails to position. Hand-operated stops, located on each side of the saw, are provided to regulate the length of the cut-off. When in proper position the rail is clamped to the table swung against the saw, and the cut made. The table is returned to position, the rail released from the clamp and moved along the table to the proper position for the second cut and the operation repeated. The rail is then skidded off the saw table to the drill press where the bolt holes are drilled. It has been found advisable to drill one end of the rails at a time.



FLOOR PLAN OF THE DANVILLE RAIL MILL

The output of the rail-sawing plant varies but slightly, depending entirely on supply. An average day's run of 10 hours on 80-lb. rail is 220 full rails or 90 tons, unloaded, sawed, drilled, straightened and loaded. The actual sawing of one 80-lb. rail end requires from 14 to 21 seconds. A rail is handled onto the table, both ends sawed, and the rail is off the table in about 1 minute and 45 seconds. The drill presses are built and operated to equal the capacity of the saw.

The saw runs in a water bath and is built on a stationary base, while the table is designed to swing the rail against it. The plant is built on the ground with all the large, heavy-duty shafting set on a concrete foundation. The journals are oil-and-forced-feed-water lubricated.

The plant operates continuously, with no delays or mechanical troubles of any kind except such as can be handled by one machinist permanently located at the plant.

The plant was built and is operated as part of the maintenance of way organization. Its machinery, equipment and installation cost complete, ready for service, was about $9,000. The organization necessary to operate consists of 17 men, divided as follows:

1 Foreman
1 Machinist and assistant to foreman
1 Combination engineer and fireman
2 Rail saw attendants
2 Drill press men
1 Hydraulic press operator
1 Night watchman
7 Laborers

In the above list the first three men must be capable of handling any special work required of them. The remainder are men taken from the various section gangs, who are taught to handle the work assigned to them and who are returned to section-gang service whenever the plant is closed down.

Figuring all overhead and actual charges due to the operation of the plant, deducting the loss of rail due to sawing 12 in. off of each end and including the salvage value of sawed ends, scrap rail and drillings, the expenditure per ton for the operation of the plant amounts to an average of about $0.70 per ton.

The Selection of Cross-Ties

THE renewal of ties has been placed on a strictly mathematical basis on the Baltimore & Ohio through the preparation of a general circular by the timber preservation department, giving explicit instructions for the selection of ties for renewals in all tracks and on all divisions. The object of this schedule is as follows:

1. To define the most economical tie for every condition of track and traffic.
2. To assist in the most economical distribution of ties and to locate the producing districts where purchase may be extended with advantage.
3. To locate and define those track districts where, on account of the combination of curves, grades and traffic, treated ties ought not to be used.

The selection given in the schedule, which provides from one to three choices as to classes and grades of ties in each case, is based on a determination of the most economical tie for each condition of track as determined by two factors, namely, the cost in track complete and the assumed life in years. The method by which this determination is made is explained in a key or supplement to the general circular.

For the purpose of selection, the ties are divided into five classes. Class A includes white oak, burr oak, chestnut or rock oak, cherry, mulberry, black walnut and locust. Class B covers chestnut only. Class C covers red oak, black oak, scarlet oak, spanish oak, pin oak, shingle and laurel oak, honey locust, beech and hard or

Items of Cost	Class A—8½′ Grade			Class A—8′ Grade			Class B—8½′ Grade		Class B—8′ Grade		Class C—8½′ Grade		Classes D and E—8½′ Grade	
	1	2	3	1	2	3	1	2	1	2	1	2	1	2
Purchase price	$ .800	$ .680	$ .250	$ .700	$ .580	$ .250	$ .500	$ .350	$ .400	$ .250	$ .610	$ .510	$ .570	$ .470
Inspection	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010
Treatment	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.220	.200	.220	.200
Freight—														
80 miles for non-treatment	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
380 miles for treated	.018	.018	.018	.018	.018	.018	.018	.018	.018	.018	.090	.070	.090	.070
Work train service	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010
(a)	$ .838	$ .718	$ .288	$ .738	$ .618	$ .288	$ .538	$ .388	$ .438	$ .288	$ .940	$ .800	$ .900	$ .760
Handling and installing	.190	.160	.160	.190	.160	.160	.160	.160	.160	.160	.190	.160	.190	.160
Two tie plates	.240	.120	.120	.240	.120	.120	.120	.120	.120	.120	.240	.120	.240	.120
Interest on (a)—														
6 months on untreated, 12 months on treated	$ .025	$ .022	$ .009	$ .022	$ .019	$ .009	$ .016	$ .012	$ .013	$ .009	$ .056	$ .048	$ .054	$ .046
Supervision	.066	.066	.066	.066	.066	.066	.066	.066	.066	.066	.066	.066	.066	.066
(b)	$1.359	$1.086	$ .643	$1.256	$ .983	$ .643	$ .900	$ .746	$ .797	$ .643	$ .492	$1.194	$1.450	$1.152
Credit salvage, one-third value tie plate	.080	.040	.040	.080	.040	.040	.040	.040	.040	.040	.080	.040	.080	.040
	$1.279	$1.046	$ .603	$1.176	$ .943	$ .603	$ .860	$ .706	$ .757	$ .603	$1.412	$1.154	$1.370	$1.112
Annual cost per tie with annual life of—														
4 years	$ .400	$ .320	$ .180	$ .360	$ .290	$ .190	$ .270	$ .220	$ .230	$ .190	$ .440	$ .360	$ .420	$ .350
6 years	.290	.240	.140	.270	.210	.140	.190	.160	.170	.140	.320	.260	.310	.250
6 percent. 8 years	.240	.190	.110	.220	.170	.110	.160	.130	.140	.110	.260	.210	.250	.210
interest 10 years	.....	.....	.....	.....	.....	.....	.140	.110	.120	.100	.230	.180	.220	.180
added. 12 years	.....	.....	.....	.....	.....	.....	.120	.100	.100	.090	.200	.160	.200	.160
14 years	.....	.....	.....	.....	.....	.....	.110	.090	.100	.080	.190	.150	.180	.150
16 years	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.170	.140	.170	.140

THE COSTS OF VARIOUS GRADES OF TIES

sugar maple. Class D includes silver, soft or white maple, red, soft or swamp maple, red or river birch, sweet or black birch, white elm, rock elm and red elm. Class E includes only shortleaf pine, loblolly pine and sap longleaf pine. Each class is subdivided into two or three grades determined by the dimensions of the tie.

The assumptions as to the life of different classes and grades of ties under varying traffic are the result of an extended investigation in which the experience and opinion of 58 engineers and trackmen were utilized. They are all men of responsibility and judgment in matters concerning track and ties, most of them being Baltimore & Ohio officers. The cost per year is the unit of comparison used, being the total cost of the tie in track. The cost and life of the ties as affected by the location relative to the supply, the character and extent of the traffic, etc., have been estimated on the basis of data accumulated as to the following items:

1. Annual tie consumption and tie supply, present and anticipated.
2. The relative quality of the same class of ties grown in different districts.
3. The most economical tie, first, second and third choice.
4. Minimum haul.

The district where grades curve and traffic conditions combine to make derailments likely, or to cause frequent rail changes from regaging, respiking, etc., have been determined by inspection on the ground, according to the weight of the locomotives used, by examination of profiles and by questioning track and operating officers.

This schedule has been prepared on the basis of using tie plates with all treated ties. Where an economy in comparative cost is shown in the use of tie plates on untreated ties it has been indicated in the schedule by adding the words "Tie Plated." The question of the use of ties obtained locally rather than treated ties shipped in from the plant has also been carefully considered, taking into account such factors as the conditions of traffic and the economy of shipping the local ties to points more remote from the treating plant with the use of treated ties locally.

Tables are given herewith to show the estimated life of ties under various conditions of traffic and the comparative annual cost of different classes and grades of ties with different length of life.

LIFE OF TIES UNDER DIFFERENT CONDITIONS

Kind of Track	Weight of Power & Traffic	Untreated																				Treated			
		Class A—8½ Feet						Class A—8 Feet						Class B—8½ Feet				Class B—8 Feet				Class C		Class D & E	
		Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Not Tie Plated	Tie Plated	Tie Plated	Tie Plated	Tie Plated
		1	1	2	2	3	3	1	1	2	2	3	3	1	1	2	2	1	1	2	2	1	2	1	2
		7″x8″		6″x7″		6″x6″		6″x8″		6″x7″		6″x6″		7″x8″		6″x7″		6″x8″		6″x7″		7″x8″	6″x7″	Class E 7″x9″	Class is 7″x8″ 6″x7″
Main Line	Heavy power, dense traffic	8	5																			11		9	
	Moderate weight power and traffic	9	6																			14		12	
	Light power and traffic	9	7					8	6													15		13	
Branch Line	Heavy power and traffic	9	6	8	5			8	5	7	4											14	12	11	10
	Moderate weight, power and traffic	9	7	8	6			9	6	7	5			9	5			7	4			15	13	12	11
	Light power and traffic	9	8	9	8	8	7	9	8	9	8	8	7	9	7			8	5				14		12
Lead and Passing	Heavy power and traffic	9	7	8	6			8	6	7	5			8	5			7	4				14		12
	Moderate weight, power and traffic			9	7			9	7	8	6			9	7			8	5				15		13
	Light power and traffic			9	8	8	7	9	8	9	8	7	6	11	7			10	6				15		14
Yard and Industrial	Heavy power and traffic			9	7	8	6			8	6	7	5	10	7	9	6	9	6	8	5		15		13
	Moderate weight, power and traffic			9	8	8	7			9	8	8	7	11	8	10	7	10	7	9	6		15		14
	Light power and traffic			9	9	9	9			9	9	8	8	12	10	12	10	12	9	11	8		16		15
Repair, temporary and storage				9	9	9	9			9	9	8	8			12	10	12	10	12	10		16		15

HIGHWAY SIGNALS.—The Public Utilities Commission of Colorado, in an order dated June 15, has directed the Atchison, Topeka & Santa Fe, and the Denver & Rio Grande, to install automatic signals at the twenty highway crossings on their lines between Denver and Pueblo. The commission, in its report, says that heretofore the public did not appreciate the usefulness of crossing signals, but is now co-operating with the carriers; a large majority of the drivers of vehicles stop when they see a "wigwag signal" begin to move. Heretofore the commission has ordered the installation of electric bells at crossings, but it is now of the opinion that where traffic is heavy there should be both an audible and a visual warning. The new signals must be installed within 60 days, and must be of a design approved by the commission.

New Station at Siloam Springs, Ark.

REBUILDING SMALL PASSENGER STATIONS

A Description of the Design and Construction of These Facilities on the Kansas City Southern

BY H. F. HAAG,
Chief Draftsman, Kansas City Southern, Kansas City, Mo.

THE Kansas City Southern was constructed between 1886 and 1897. During the latter part of this period most of the passenger and freight depots were built, the majority having been constructed from 1895 to 1897. Owing to the fact that, when first built, the road was located through a sparsely settled country, most of these passenger stations were originally of frame construction with shingle roofs and timber foundations, being about the average usually found on a new line in this part of the country.

As the country has rapidly settled and also as many of these stations have become dilapidated with 20 or more years of service, it was decided that the rehabilitation of a considerable number of such structures, necessitating more commodious buildings, was necessary. Where conditions did not demand a larger or better building, it was renewed with the same type, such structures being of frame with composition roofs and placed on pile head foundations. The platforms were of shell, cinders or chats, the layout including a small freight platform, a water closet and a coal bin. This class of facility, with the building 20 ft. by 60 ft. in size, and the grading nominal, cost on an average $1.46 per sq. ft. of depot floor space, the depot proper averaging about $1 per sq. ft.

The next improvement in the type of passenger or combination depot consisted in adding a concrete foundation with concrete walls up to the window sills, a slate or a composition roof and drop siding or stucco above the window sill line. Such buildings, however, cost from $4,000 to $6,000, averaging from $1.78 per sq. ft. for drop siding and a composition roof to $2.10 for stucco siding and a slate roof, these figures including the cost of platforms and outhouses. It was felt that, although the result was a substantial, fairly attractive looking building, the expenditure of an additional amount of money would result in a building with a longer life, which would compare very favorably with the better class of passenger depot, and would be capable, if necessary, of being enlarged to care for an increase of traffic that could not be foreseen when the plans were prepared.

With this in mind, the company has prepared and is now working on a comprehensive program which covers the renewal and rehabilitation of practically all of its passenger depots. This program calls for an expenditure of $80,000 per year for the next five years. This, together with over $50,000 spent last year and the expenditures for 1912 to 1914, means a total cost for such structures of over $750,000. The buildings to be so rehabilitated vary from small shelter buildings at $750 to pretentious layouts costing $75,000. Among the facilities so provided in the last few years may be mentioned those at Fort Smith, Ark., which, together with tracks, real estate, etc., cost upwards of $200,000, the Union Station at Joplin, Mo. (the Kansas City Southern Company being one-fourth owner of the Joplin Union Depot Company), the improvements at Kansas City, Mo., and many smaller projects.

A type of building costing from $10,000 to $15,000 and averaging about $12,000, which has been erected during the last year at Anderson, Mo., Siloam Springs, Ark., Stilwell, Okla., and Sallisaw, Okla., has given excellent satisfaction and has created such favorable comment that it is with this type of building that this article deals

primarily. Incidentally, it may be stated that a station of this type is now being built at Spiro, Okla., and plans are being prepared for one at Leesville, La.

The plans for these structures are prepared in the office of the chief engineer, except at such times as several are under way at one time, in which case it is sometimes necessary to have them prepared by outside architects. It is the company's experience that the cost of the preparation of the plans and specifications, including the preliminary studies, together with changes and modifications, averages from 20 to 35 man days. The superintendence varies, depending upon the length of time of construction, but averages about $175 per month, which makes the engineering and superintendence, including field engineering, average about 7½ per cent.

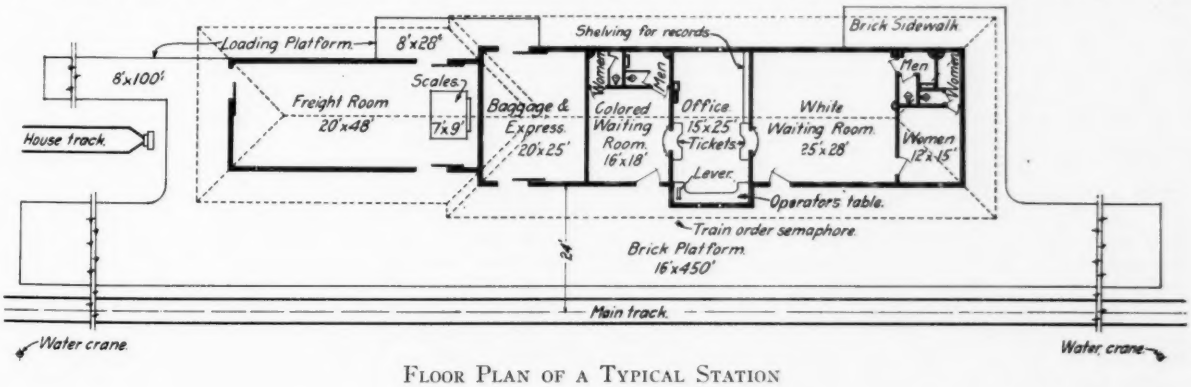
When plans for a new depot are to be prepared, information is received from various sources. The division engineer furnishes a corrected station plat showing all tracks, buildings, street improvements, sewers, water lines, gas supply, electric light lines, and other data that might affect the design or layout. He also furnishes cross-sections of the depot and platform site, and a top of main rail profile, together with any suggested changes in the present layout. The operating officers are called upon to furnish data as to the square feet of floor area they recommend for various facilities, the number of passengers handled, the number of pieces of baggage handled, the present population with the rate of increase, the amount of money the business will warrant spending, etc.

As an example of how the space is assigned for waiting rooms, baggage rooms, etc., the following outline made for one of the larger stations will answer: The number of passengers handled from October, 1912, to September, 1913, totaled 145,397, of which 67,377 were outbound and 78,060 inbound, a monthly average of 12,116, and a daily average of 398. The largest number handled in any one day was 2,017, but on account of certain local conditions, this figure was ignored and the average was used. The ticket sales in 5 years were $541,991.94, a monthly average of $9,599.89, which, upon analysis, showed a yearly increase of 4.2 per cent. The life of the building was assumed as 30 years, but it was decided that it would be necessary to provide only for 20 years' growth, which, assumed at the same rate for the previous 5 years, gave 84 per cent as the increase that had to be provided for. On this basis it was figured that in 20 years there would be handled 339 outbound passengers and 394 inbound, or a total of 733, per day. There were four through and four local trains and investigations showed that the local trains handled about 25 per cent of the traffic. This local traffic was of such a character that it was felt that it should be disregarded because of certain peculiar local conditions. Two through trains arrived between 7:30 and 9 p. m. and two through trains between 8:30 and 9:30 a. m. If one of the trains should be late and encroach on the time of the other, the number of passengers to be handled at one time would approximate one-half of the 75 per cent of the passengers, or 275. To this was added the number of trainmen, attendants, visitors, etc., assumed as one-third, which gave a total of 360 people. The proportion of

NEW STATION AT SALLISAW, OKLA.

negro travelers was one-fourth, or about 90 negroes and 270 whites. Allowing 12 sq. ft. per colored individual, it would require 1,080 sq. ft. for the negro waiting room. This amount per individual is conservative, but investigation showed that owing to climatic conditions, the majority stayed outside the building, except in inclement weather, so that it was felt the space assigned would be adequate. The number of white passengers who would stay in the depot for any length of time was determined as 15 per cent, for whom smoking room and rest room should be provided. At 20 sq. ft. per individual, it required about 400 sq. ft. each for a smoking room and a ladies' rest room. This left 229 white people, of whom one-third passed directly through the building, leaving 153 to be accommodated in the general waiting room. At the rate of 15 sq. ft. per individual, 2,295 sq. ft. was required. During 1913 there were handled an average of 2,466 pieces of baggage per month, or 81 per day. The same rate of increase would give an average of 149 pieces per day at the end of 20 years. Assuming that two-thirds would be housed at one time and that the space required for each piece would be 2½ ft. by 2½ ft., it would require 625 sq. ft. of space for storage, or in reality one-half of this area, if it is assumed that pieces would be piled on top of another, but that baggage for two trains would have to be handled at one time. This area should be doubled on account of trucking space, scales, counter, etc., which required 938 sq. ft.

This method is, of course, approximate, but has given results close enough so that plans could be prepared with-



FLOOR PLAN OF A TYPICAL STATION

out guessing at what was required or going to the other extreme of making too costly and lengthy an investigation.

In the construction of the depots built in 1915, an inspector was appointed whose duty it was to handle all details of the work from the time the contract was let until final payment was made. Every two weeks he transmitted a progress report, an illustration of which is shown, which report was accompanied by two or three photographs. When the job was completed these progress reports were attached, together with a completion report, to the A. F. E., or work order, thus giving a complete record of every stage of construction. This manner of making such comprehensive reports and of keeping accurate cost data is one of the reasons why the engineering costs on these jobs are comparatively high.

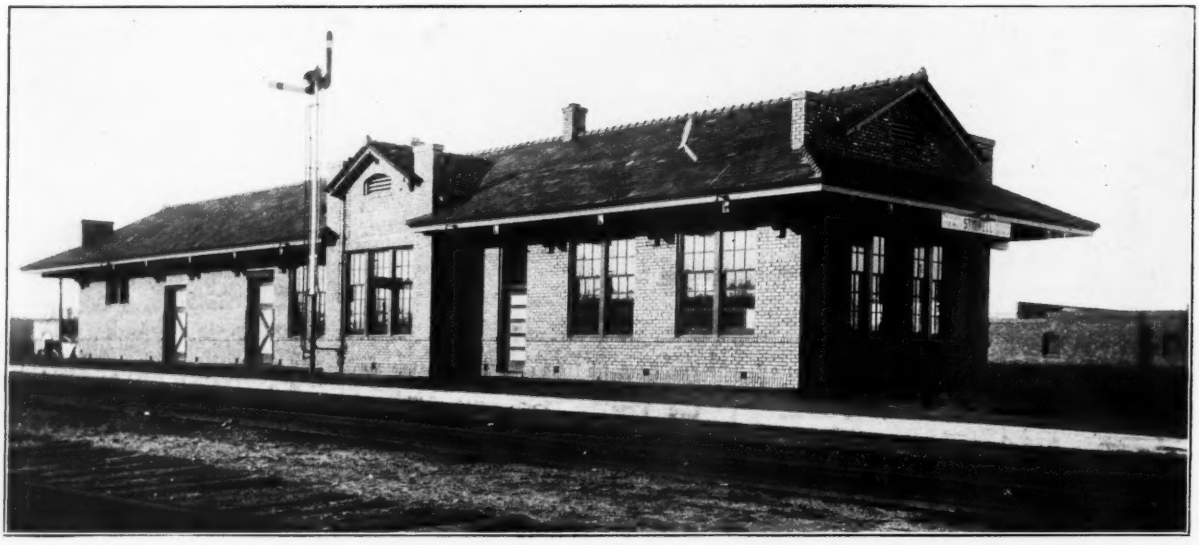
In providing a new depot in the country traversed by the Kansas City Southern, some conditions are met with that are not common to other localities. Misuse of toilet facilities, for instance, in some sections is so common that these conveniences are only installed inside the building under unusual conditions. High ceilings must be provided in the South on account of the heat. An excessive amount of express as compared with passenger traffic must be provided for, because of the very heavy express business handled. Waiting rooms for the races must be provided and cannot adjoin each other.

In the new buildings constructed last year, experiments were made with different roof pitches. At Anderson, Mo., the pitch is 9 in 12, while at the other stations it is somewhat flatter. For appearance alone this pitch seems desirable, as it eliminates the squatty appearance which is prevalent with depot buildings. The roofs are all of first-class red tile with one exception, where some slate that was on hand was used with a red tile ridge and hip roll.

The foundations are of concrete carried to a good footing and extending to the platform elevation. The concrete, a 1:3:5 mixture, is reinforced only at the corners and offsets.

The walls are of a rough surfaced, dark red brick, costing about $13.50 per thousand. All walls are 13 in. thick and are carried up for roof rafters to rest upon. The brick are all laid with a flat recessed joint. The wall between the freight room and the rest of the building is a 13-in. brick wall, which acts as a fire wall, although the door from the freight into the baggage room is of wood.

Where the ground surrounding the building is at about the same level as the tracks, the freight room floor is elevated 2 ft. 10 in., so that it is at the same elevation as the body of a wagon or the floor of a car. There is also a 6-ft. platform in the freight room end of the baggage room, so that trunks can be left for storage without having to lift them up or down from the baggage trucks. Of course, when the tracks are somewhat higher than the adjoining ground, all the floors in the building are on the same elevation. The baggage room, office and negro waiting room floors have a 5-in. concrete floor on a 12-in. cinder fill. The freight room floor is of shiplap on creosoted sleepers in a cinder fill, which type of floor has given excellent service, although it is somewhat hard to renew. In the bay in the office a wood floor is used, as it is found that it gives better service and is better liked by the operator. The floor in the white waiting room is of marble terrazzo with a base of the same, having a 2-in. cove.



NEW STATION AT STILWELL, OKLA.

The freight rooms and the baggage room are whitewashed; the office and negro waiting room are ceiled above the chair rail and the white waiting room is plastered above the chair rail. The interior walls in the white waiting room are a smooth brick veneer up to the chair rail, which permits of the room being flushed.

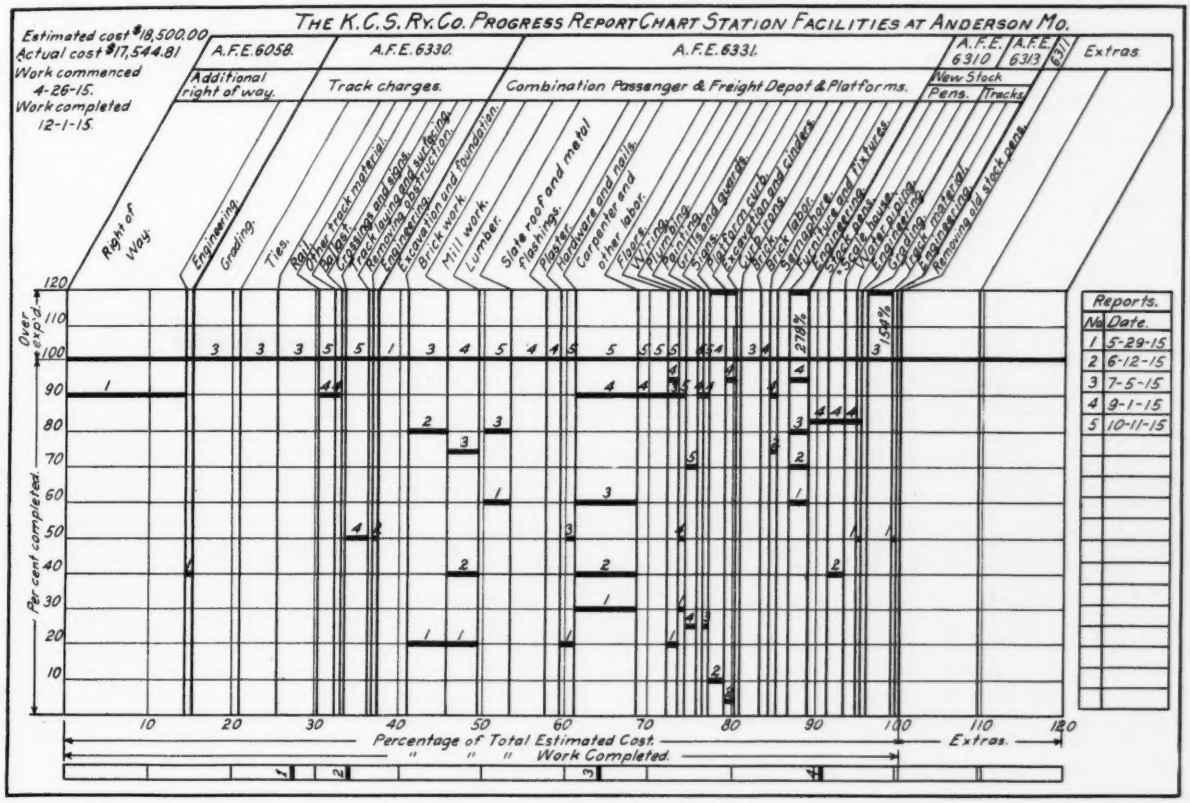
Except where absolutely necessary, sanitary toilets are not installed because of the nuisance committed therein by the lawless element. It may seem surprising to hear that in one town where a new depot was constructed in which sanitary toilets were provided, the privilege was abused a number of times in the first week the new building was opened. In this same town another road has a monthly expense of $50 to keep its toilets in proper condition. Where toilets are not placed in the buildings, a separate building is constructed several hundred feet away, which is screened and provided with metal dry boxes.

In all the depots plenty of shelving and cupboard space is provided for the storage of records, stationery, etc. This is an item that is very often overlooked, especially in combination depots. Another convenience for the agent is a slop sink, where he can wet his copying cloths

and do other similar work which requires running water.

Steam heat is supplied only at the largest stations. In all cases, except where gas is available, coal stoves are used. Coal is stored in a 6 or 8-ton coal storage house located adjacent to the house track. Where electricity for lighting is not available, oil lamps are used. When this is necessary, oil boxes are placed at the ends of the platform. These boxes are about the size of a tool box, are lined with metal and are kept locked. All oil must be stored therein and it is required that the filling and cleaning of lamps be done away from the building proper.

Platforms are made of brick and are 450 ft. long and



A TYPICAL PROGRESS CHART

16 ft. wide at the ends, the depot being placed 24 ft. back from the center of the main track. The brick are laid in herringbone fashion on a 2-in. sand cushion. The curb is of concrete 6 in. thick with a batter on the outer side and 18-in. footings. The platform is placed 5 in. above the top of rail at the curb, 5 ft. from the center of the track and has a 2-in. crown to shed water. In front of the depot the platform has a straight slope of 4½ in. from the curb to the building line. At the less important stations the platform is made of cinders, shell or chats with curbing made of old bridge stringers. At a station where there is a water supply, a 50,000-gal. capacity steel tank equipped with a spout is placed at one end of the platform, while a 10-in crane supplied by a 12-in. line is located at the other end, which permits an engine to take water while a train is stopping to receive or discharge passengers and baggage. No type of concrete platform has been found satisfactory owing to the fact that it is impossible to keep them from cracking or chipping when heavy articles are dropped on them. They do not offer so good a foothold as brick and require more labor to keep them clean.

The freight room, as before stated, sometimes has an elevated floor. It is equipped with a 4-ton capacity warehouse scale placed on a concrete foundation. Doors are provided in the front, rear and end of the room.

The latest type of pipe-connected train order semaphore is provided, working in the upper quadrant, with an iron pole set in concrete. The table lever is placed on the right hand side of the bay, 14 in. from the side wall, which makes it accessible and at the same time it does not interfere with the telegraph instruments.

Telegraph, telephone and electric light wires are carried into the building in an underground conduit, the end of the conduit curving upward and terminating at the chair rail. Batteries are placed in cupboards and all wires are run through conduits concealed in the walls. Battery cupboards are placed under the ticket window shelves.

In order to facilitate the handling of business with the agent, the door between the office and the white waiting room is cut through the center, making what is commonly called a "Dutch" door, the lower half having a shelf covered with sheet iron. This serves as a counter and at the same time keeps the public out of the office. Depending upon local conditions, either a drinking fountain or a water cooler is installed. An oak bulletin board having a glass cover and a train bulletin board are also a part of the new equipment. In the average size station a seating capacity for 72 people is provided. These settees are of solid oak, costing about $2 per foot, with their backs just high enough to fit in under the chair rail. The accompanying illustrations give a fair idea of the appearance of the stations, although they cannot do justice to the color effects that have been secured.

Following are some detailed costs on two of the new depots erected:

	Anderson, Mo. (Non-competitive)	Sallisaw, Okla. (Competitive)
Population	1,600	3,500
Average number of passengers per train	42	52
Average number of pieces of baggage per train	8	12
Sq. ft. of floor space in the building.	2,880	3,692
Cost per sq. ft. of building (all items)	$6.09	.....
Cost per sq. ft. of building (building and platform only)	$3.34	$3.27
Cost per sq. ft. of brick platform....	$0.18 (includes curbing)	$0.22 (includes hand rail and 6-ft. retaining wall)
Sq. ft. of waiting room space per passenger	20	20
Sq. ft. of baggage room space per piece of baggage	55	44
Detailed Cost of Facilities:		
Passenger platform	$ 1,560.00	$ 1,845.00
Freight and baggage platforms.....	170.00	154.00
Telegraph and telephone lines.....	225.55	190.32
Semaphore	80.00	80.00
Furniture and fixtures:		
Settees	152.00	178.05
Lighting fixtures	65.15	164.36
Scales	99.00	102.00
Building:		
Roof	802.00	1,205.00
Floors	600.00	(Wood floors included in brick and frame work)
Wiring	249.00	220.00
Plumbing	75.00 (outside toilets)	665.00
Foundation and fill	435.00	823.00
Mill work	805.00	868.50
Painting	190.00	251.67
Plastering and stucco	180.00	347.00
Hardware and iron work	250.00	253.00
Brick and frame work	2,542.73	2,755.00
Drinking fountains and cooler	.....	101.50
Track surfacing	.....	49.47
Grading and road crossing	.....	221.73
Freight charges	347.42	436.59
Engineering and supervision	798.67	1,169.24
Other items necessary on account of new depot, such as new stock pens, additional right of way, driveways, paving, etc	7,918.29	
Grand total	$17,544.81	$12,080.43

The Gasoline Situation

BY M. E. CARROLL

THE abnormal industrial conditions which have existed throughout this country for several months past have created many interesting, and sometimes perplexing, problems for the railroads. Owing to the interruption in our customary channels of supply through importation, many articles formerly in daily use have become quite scarce and difficult to obtain. On the other hand, a stimulation in our exports of other items has resulted in a scarcity in the home market, and resultant rise in prices.

Of the many commodities in general use which have been affected by the changed conditions, resulting in a price increase of about 100 per cent during the past year, is one considered to be a daily necessity, viz., gasoline. The price of gasoline in the early part of 1915 was about 8 cents per gallon for tank wagon delivery through the Middle West, 10.5 cents in Chicago, and 15 cents in New York, while by the end of the year it had risen to 16.5 cents per gallon in Chicago and 21 cents per gallon in New York. In 1916 further increase has been witnessed.

There are many reasons for this advance in price. The first and greatest is the unprecedented increase in the number of automobiles in service. Those informed in the automobile trade estimate that in 1910 there were about 350,000 automobiles in service in the United States, while at the beginning of this year there were 2,250,000, this number being added to at the rate of 4,000 new machines per day. Presuming that every new automobile tank receives 10 gallons of gasoline for the first trip, this would represent a daily increase in gasoline consumption of 40,000 gal. There are also to be considered the farm tractors coming into general use throughout the central and western states, and the motor trucks, which are rapidly replacing horses on city streets. Several thousand motor trucks have been exported for war purposes, and our exports of gasoline have grown accordingly. We are now exporting 300,000,000 gal. of gasoline per year, which is greater than the entire amount used in this country only a few years ago.

In the face of this increased demand, the production of petroleum has failed to increase accordingly. The principal new petroleum fields are producing crude oil which is low in gasoline. California produces about 100,000,000 bbl. of petroleum a year, the best of which has only about 5 per cent gasoline. The famous Cushing field, which some time ago produced 300,000 bbl. of petroleum a day, containing 30 per cent gasoline, has fallen off to 100,000 bbl. a day in production.

During the period while these developments and changes were in progress, the railroads were increasing each year their demand for gasoline. Many steam pumping stations and the uncertain wind-driven pumps have been superseded by gasoline-driven pumps. The labor conditions on track work have changed, and with this has come the gradual change from hand cars to gasoline-driven motor cars for section use. That these and other conditions have affected the gasoline situation is shown by the total purchase of gasoline for any large railroad system. One road of 6,000 miles in the central west purchased 132,000 gal. of gasoline during 1912, while in 1915 its annual consumption had increased to a total of 428,000 gal. During the same period the average purchase price on this road increased from 10.5 cents to 16.5 cents.

Not only has the first cost of gasoline increased, but the railroads are put to more expense than formerly in handling and caring for it. Gasoline is to-day just as staple an article of domestic use as sugar or bread, and when distributed over the greater part of a railroad's territory, must be protected against loss in other ways than through evaporation. This necessitates additional expenditure for the construction of suitable storage stations for the gasoline supply, and a careful checking system of receipts and disbursements to know that the losses are not unnecessarily great.

There is scarcely a railroad in the central or western portion of the country that does not average about 1 gasoline motor car for every 10 miles of main track, and as few of these cars will operate on less than 4 gal. of gasoline per hundred miles, the total consumption of any one road is considerable. Considering the length of a section to be 10 miles and the standard practice to go over the track on hand car or motor cars once each day,

this would mean, together with such side trips as going for water, tools, trips to the telegraph office, etc., enough miles each day to consume one gallon of gasoline for fuel. If there is no waste or improper use of gasoline, we would have an addition to what we have considered our normal expenses of at least 10 cents a day for each motor car operated. This appears like a small sum, but when comparing our expenses with those for some previous period it represents a clear waste because we do not get any greater results from a gallon of gasoline now than we did years ago. This means on the average main line division an additional expense of $4 or $5 per day, and on an average railroad having one gasoline-propelled car for every 10 miles of main track, an increase in expenses of about $21,000 per annum. Some roads have made a reduction in the gasoline consumption on these cars by placing a small feed tank for gasoline on each car and filling the main tank with kerosene of good quality. The motor car is started with gasoline and after running a short distance, the cylinders become warm. The gasoline supply is then shut off and the car operated for the balance of the trip with kerosene as fuel.

Many pumping stations and train yard air compressors formerly operated by means of gasoline engines have been changed over to fuel oil or distillate engines at small expense, with a resultant saving in expense for fuel. The expense of operating pumping stations by gasoline varies widely between different railroads, but the average road in the middle west is using about one gallon of gasoline for this purpose to every two gallons used on motor cars, and additional costs through increase in gasoline prices can be computed accordingly. The expense of changing a gasoline pumping engine or electric generator engine for charging signal department storage batteries so fuel oil or distillate may be used instead of gasoline is about $96, including a suitable storage tank for the new kind of fuel.

It is very easy to waste gasoline, and the present high cost of this commodity emphasizes more than ever the need of taking care of the supply and instructing employees in regard to its proper use. Gasoline is wasted by evaporation when stored in tanks or cans which are not air tight; by improper use when stored at places where unauthorized persons can help themselves to the supply for their personal use; by extravagance in operation of gasoline engines of all kinds through failure to control the supply of gasoline to the carburetor, thus allowing more gasoline to be burned in the cylinders than is necessary to procure a proper explosion; by leakage in handling through failure to furnish a proper measuring can, funnel, etc., much gasoline being wasted while supply is being put into tank and into the feed reservoir of the engine, because of careless handling.

When an annual consumption of 400,000 gal. or more for any given railroad is considered, and the price of gasoline has doubled, while it is costing four times as much per gallon as fuel oil or distillate, and three times as much as good quality kerosene, it is obvious that a little study on the part of division officers in charge of gasoline operation should effect a considerable saving on each division where gasoline engines of various kinds are in general use.

Wood Preservation Statistics

THE proceedings of the American Wood Preservers' Association contain some valuable statistics on the quantity of wood preservatives consumed and the amount of wood treated by wood-preserving plants in the United States in 1915. These are compiled by the association in co-operation with the forest service of the United States Department of Agriculture. The following information is abstracted from this report:

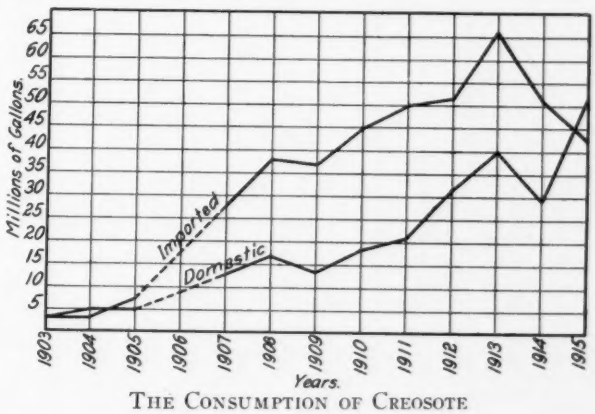
In 1915, the 102 wood-preserving plants operating in the United States during the year treated about 141,858,963 cu. ft. of timber. In 1914 with 8 less plants operating 17,723,676 cu. ft. more timber was treated. In spite of this decrease in the total output, there was an increase of 1,986,286 cu. ft. in the amount of construction timber treated. The number of cross-ties subjected to treatment in 1915 was 37,085,585, a reduction of 6,761,402 from the figures of 1914. The amount of wood block paving increased 319,467 sq. yd., or 11 per cent, and the preservation of piling aggregated 9,308,419 lin. ft., an amount less than that reported in 1914 by 2,612,182 lin. ft.

TABLE 1.—CONSUMPTION OF WOOD PRESERVATIVES BY THE TREATING PLANTS IN THE UNITED STATES, 1909-1915

Year	Number of Plants	Creosote Gallons	Zinc Chloride, Pounds	Other Preservatives, Gallons*
1909	64	51,431,212	16,215,109	†
1910	71	63,266,271	16,802,532	2,333,707
1911	80	73,027,335	16,359,797	1,000,000
1912	84	83,666,490	20,751,711	3,072,462
1913	93	108,373,359	26,466,803	3,885,738
1914	94	79,334,606	27,212,259	{ 9,429,444‡ 2,486,637
1915	102	80,859,442	33,269,604	{ 3,205 563‡ 1,693,544

*Includes crude oil, coke oven-tar, refined coal-tar and carbolineum oils.
†Statistics not available.
‡"Paving oil."

Table 1 shows the consumption of wood preservatives used by the treating plants by years and by kinds. The consumption of zinc chloride exceeded that of any previous year and the amount of creosote used was slightly more than the amount used in 1914, which was a decrease of about 27 per cent from the quantity used in 1913. As seen in the accompanying diagram, for the first time since the active development of the wood preservation industry in the United States, the consumption of domestic creosote exceeded that of the imported oil, and would tend to show a gradually decreasing dependence upon the foreign supply for American consumption. The price of domestic creosote in 1914 was approximately 8½ cents per gallon, f. o. b. plant, and that for zinc chloride 3 cents per pound. Owing to the un-



THE CONSUMPTION OF CREOSOTE

certainty of foreign shipments and the total lack of them at times during the past two years, the prices of both kinds of preservatives have practically doubled since that time.

Table 2 shows the number of cross-ties treated by kinds of wood and kinds of preservatives in 1915. The number of ties treated in 1915 was less by 6,761,402 than in 1914. This decrease was greater for hewed than for sawed ties, the total quantity reported being 25,831,204 hewed and 11,254,381 sawed. Oak ties again take the lead in the number treated and constitute 45.53 per cent of the total number of all species. Yellow pine ties are second and constitute 23.03 per cent. The number of ties treated with miscellaneous preservatives was only 6,520 in 1915, as compared with 2,625,681 in 1914.

FLAT SLAB TESTS.—Bulletin No. 84, recently issued by the Experiment Station of the University of Illinois contains an account of an elaborate series of tests on flat slab structures built according to various systems and in a number of different buildings, including the Soo terminal at Chicago, where the slab carries railroad loading. While it is not pretended that these tests will clear up the cloud of misunderstanding which now surrounds flat slab design, they are of material value because of the manner in which the tests were conducted, because of the number of types of floor brought into comparison and because, unlike most other tests of this kind, they have not been made for the purpose of exploiting any single type. One of the conclusions reached in these tests is that there is need of others on structures built for test only. Results to be obtained with complex structures built for commercial purposes leave much to be desired because of the elements of strength which the component parts of the structures impart to each other. These should be eliminated in future tests.

TABLE 2.—NUMBER OF CROSS-TIES TREATED, BY KINDS OF WOOD AND KINDS OF PRESERVATIVES, IN 1915

Preservative	Oak	Yellow Pine	Douglas Fir	Western Pine	Beech	Gum	Tamarack	Maple	Birch	Elm	Other Species	Total
Creosote	7,365,673	5,243,516	787,247	301,581	2,469,202	1,650	390,017	36,626	173,916	.....	307,641	17,077,069
Zinc Chloride	7,954,492	3,257,565	2,760,952	1,702,167	100,000	204,653	449,660	316	55	50,846	1,338,578	17,819,284
Zinc Chloride and Creosote	1,565,352	40,122	.....	3,861	364,535	71,583	91,496	.....	.....	.....	45,763	2,182,712
Miscellaneous	.....	.....	5,655	.....	.....	.....	865	.....	.....	.....	.....	6,520
Total	16,885,517	8,541,203	3,553,854	2,007,609	2,933,737	277,886	932,038	36,942	173,971	50,846	1,691,982	37,085,585
Per cent of total needed	45.53	23.03	9.58	5.42	7.91	0.75	2.51	0.10	0.47	0.14	4.56	100.00

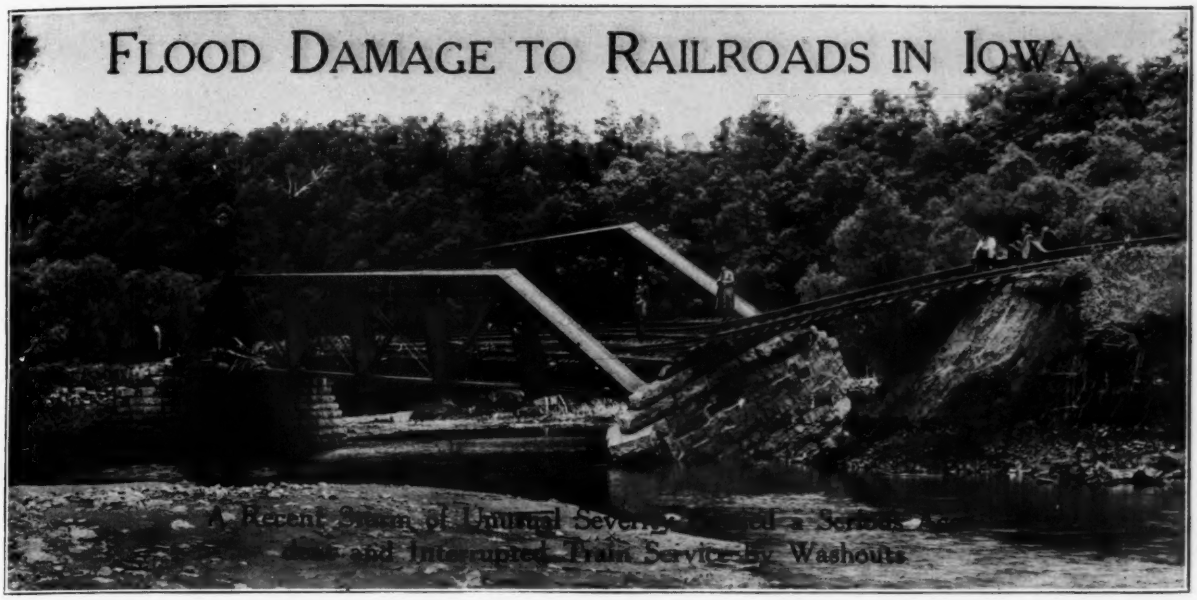
TABLE 3.—COMPARATIVE STATEMENT OF MATERIAL TREATED IN THE UNITED STATES, 1909-1915, INCLUSIVE

Preservatives.	Year	Cross Ties. Cu. Ft.	Piling. Cu. Ft.	Poles. Cu. Ft.	Paving Blocks. Cu. Ft.	Construction Timbers. Cu. Ft.	Cross-Arms. Cu. Ft.	Lumber and Miscellaneous. Cu. Ft.	Total Material Treated. Cu. Ft.
Creosote	1909	29,830,080	4,421,726	659,664	2,994,290	4,902,311	41,764	417,787	43,267,622
	1910	44,525,229	5,219,254	255,597	4,692,453	7,801,272	88,069	2,687,713	65,269,587
	1911	49,532,163	4,937,363	106,213	10,145,724	7,417,105	71,961	2,499,995	74,710,524
	1912	57,461,515	7,624,939	1,169,981	7,091,658	6,892,493	1,643,128	2,841,195	84,724,909
	1913	75,998,307	7,630,328	2,367,769	6,810,308	10,308,883	1,813,010	1,853,993	106,782,598
	1914	67,774,329	7,804,657	1,188,511	3,127,506	8,389,158	395,403	1,348,566	90,027,630
	1915	51,231,207	6,288,238	2,336,318	1,174,319	9,264,164	87,373	981,028	85,115,647
Zinc Chloride	1909	24,153,162	.....	.....	.....	320,891	.....	2,333	24,476,386
	1910	27,587,583	.....	.....	.....	541,514	.....	71,060	28,200,157
	1911	28,337,883	.....	.....	.....	1,043,851	.....	119,931	29,501,665
	1912	28,532,874	.....	18,246	.....	259,972	.....	20,092	28,831,184
	1913	36,051,816	.....	47,996	.....	585,756	.....	7,670	36,693,238
	1914	50,020,755	.....	.....	.....	1,317,925	.....	4,355	51,343,035
	1915	53,457,852	4,726	.....	.....	2,406,150	.....	275,279	56,144,007
Zinc Creosote	1909	8,095,794	.....	.....	.....	62,918	.....	43,699	8,202,411
	1910	6,354,219	38,392	.....	.....	181,143	.....	30,646	6,604,400
	1911	7,312,374	.....	.....	.....	.....	.....	.....	7,312,374
	1912	8,214,303	97,874	.....	.....	560,613	.....	99,367	8,972,157
	1913	6,938,838	327,594	.....	.....	758,989	.....	53,628	8,079,049
	1914	5,868,834	.....	.....	.....	140,718	.....	.....	6,009,552
	1915	6,548,136	2,320	110,220	.....	40,396	.....	4,822	6,705,894
All Preservatives	1909	62,079,036	4,421,726	659,664	2,994,290	5,286,120	41,764	463,819	75,946,419
	1910	78,467,031	5,257,646	255,597	4,692,453	8,523,929	88,069	2,789,419	100,074,144
	1911	85,182,420	4,937,363	106,213	10,145,724	8,460,956	71,961	2,619,926	111,524,563
	1912	97,183,009	7,737,035	1,188,579	7,397,095	7,793,524	1,643,128	2,988,686	125,931,056
	1913	120,781,248	7,957,922	2,500,420	6,856,293	11,653,628	1,824,719	2,039,658	153,613,888
	1914	131,540,961	8,061,902	1,482,407	6,869,370	9,847,801	417,914	1,362,284	159,582,639
	1915	111,256,755	6,295,284	2,512,780	7,707,971	11,834,087	90,627	1,161,459	141,858,963

CONVERTING FACTORS

To obtain the number of cross-ties, divide figures shown by 3.
To obtain the number of lineal feet of piling, divide the figures shown by .6763.
To obtain the number of lineal feet of poles, divide the figures shown by .5868.
To obtain the number of square yards of paving blocks, divide the figures shown by 2.625.
To obtain the number of board feet of construction timbers, multiply the figures shown by 12.
To obtain the number of cross-arms, divide the figures by .6198.
To obtain the number of board feet of lumber and miscellaneous material, multiply the figures shown by 12.

FLOOD DAMAGE TO RAILROADS IN IOWA



Settlement of an Abutment Near North McGregor, Iowa

THE location of a railroad and the proportioning of the bridges and culverts which are required in its construction always give rise to conjecture as to the justification of provisions for the unusual or occasional storm or flood and it is commonly held that security against all possible contingencies cannot be justified. To provide for such storms as occur only at long intervals would in most cases result in such an increase in the fixed charges as to place an undue burden on the business of the railroad. This being accepted, each unusual occurrence must be disposed of when it takes place, as a problem by itself.

A condition of this kind presented itself on the night of June 1 in a wind and rain storm which passed across eastern Iowa in a southeasterly direction into southern Wisconsin and northern Illinois, the equal of which had not occurred in 20 years. A number of railroads in the path of this storm suffered heavily. Rock Island train No. 2, running north from Cedar Rapids, Iowa, encountered a weakened embankment at the approach to a bridge near Packard, Iowa, which, through a series of peculiar circumstances, caused the wreck of both the train and the bridge and resulted in the death of several persons. Further east along the Iowa and Dakota division of the Chicago, Milwaukee & St. Paul the storm caused many washouts, particularly in the 14 miles just west of North McGregor, Iowa, where the railroad follows the course of Giard creek in making the descent to the Mississippi river bottoms. Crossing over into Wisconsin, the storm resulted in washouts on the Burlington which interrupted train service for some time between La Crosse, Wis., and Savanna, Ill., while at Sauneman, Ill., Wabash train No. 17 was blown off the track by what was apparently a small tornado.

The bridge on the Rock Island and many of the structures affected on the Chicago, Milwaukee & St. Paul had been in place for 20 years, proving adequate for all storms which had occurred in that time. Many of the bridges along Giard creek on the St. Paul, replaced structures which were destroyed by a flood on May 24, 1896, their proportions and details having been determined after a careful study of the information presented by the earlier storm.

The Rock Island bridge consisted of three 42-ft. deck girder spans. The abutments were of the pier or buried type with the spill of the ends of the embankment completely surrounding them. The piers were of somewhat unusual design, consisting each of two masonry pedestals on a concrete footing with pile foundation and surmounted, about five or six feet above the bed of the stream, by a brick pier with a stone masonry bridge seat and a brick arch between the two pedestals. These piers were reinforced at the elevation of the arch by two steel rods, one on each side, with a plate across each end.

The sub-structure was built in 1896 and the steel was put on in 1897. From that time until the flood that caused the wreck, no trouble had ever been experienced with high water. The storm and flood of the night of June 1 were the greatest of which there is any record in the vicinity.

The cause of the accident as described hereafter is based upon a study of the situation on the ground after the accident and from the testimony of persons on the train. It was dark when the accident occurred and little could be seen until daylight. A work train had been sent over the track about 40 min. ahead of the passenger train as a precautionary measure and an inspection of the bridge at that time indicated that no damage had been done by the flood water. However, in the time intervening before the passenger train arrived the embankment behind the south abutment was weakened to such an extent by scour at the toe of the upstream slope that it gave way under the weight of the train. The engineer reported feeling the track go down under him, although the engine, tender, mail car and baggage car went across the bridge safely on the rails. By the time the smoker crossed this depressed portion of the embankment, it had settled to such an extent that the car struck the back wall of the abutment with sufficient force to drive the girders of all three spans north longitudinally three feet, pushing back the parapet wall of the north abutment. As the girders were anchored to the piers, they carried the tops of the piers with them, breaking the bond between the masonry pedestals and the brick work. As a result the tops of the piers were forced about three feet out of plumb.

The smoking car was apparently derailed at the south end of the bridge and went across on the ties, bunching

all those in the last span. The chair car following the smoker fell into the river when it reached this span. The first sleeper stopped with its north end just over the south pier and the south end on the embankment, the girder span dropping down underneath it, as shown in one of the accompanying photographs.

It is supposed that the hammering of the trucks of the several cars on the south abutment as they passed over it onto the bridge beat it down so that at the time the first sleeping car passed over it the abutment collapsed.

The embankment washed out behind the south abutment for about 30 ft. No farther damage was done to the bridge by the action of the flood water. It is apparent from this that the failure of the bridge was really caused by the derailment of the train behind the south abutment. The people who lost their lives in this accident were drowned in the chair car, one end of which was completely submerged in the stream.

THE GIARD CREEK FLOOD

The location of the Iowa and Dakota division of the Chicago, Milwaukee & St. Paul for the 14 miles along Giard creek is one that would naturally be subject to flood conditions in case of a heavy storm. The valley is narrow and winding with steep sides and a water grade of about one per cent. The railroad crosses the creek many times in this distance with bridges varying from 50 to 150 ft. in length. As the valley approaches the Mississippi river it widens out, affording space for the village of North McGregor and a freight and engine terminal for the railroad which includes a considerable yard layout and a 17-stall roundhouse.

Combining the topographic layout of the valley with a storm traveling in the direction of the flow and the fact that no freshets had occurred in a long time to carry away accumulations of rubbish, the conditions were especially favorable for serious destruction of property in the valley. That the storm was especially severe at this point is evidenced by the fact that three branch lines of the St. Paul in this vicinity also suffered interruption of train service because of washouts.

Practically all the highway bridges in the valley were destroyed. Of 30 railroad bridges in the 14 miles between North McGregor and Valdora, two had superstructures washed off the masonry by the flood and drift; one lost a pier, thereby dropping two girder spans into the stream, four others suffered more or less serious damage to their sub-structures through settlement and erosion, and practically all of the other bridges were isolated through the washing out of the embankment behind the abutments. Nearly a mile of main track was washed out in the 14 miles of line. In one case, three double track girder spans, 50 ft. long, were carried 500 ft. away from the bridge site. In another case a 130-ft. through truss span was lifted off its abutment and swung around parallel to the stream.

Although the valley of the creek is much wider in the vicinity of North McGregor, the volume of the water was sufficient to cover the freight yard to a depth of from six to eight feet, washing out much of the track. There were 300 cars in the yard at the time, 65 of which were tipped over or carried some distance when the tracks were displaced. About 60 cars containing merchandise were submerged from two to five feet above the floor level, causing a heavy loss to the lading.

As shown in one of the accompanying photographs the roundhouse was badly wrecked, part of the roof being torn off by the high wind and a part of the walls being caved in by the pressure of the water and the impact of the drift which it carried. The 11 engines which were in the house at the time were covered with debris, a foot of mud covered the floor and the turn-table pit was filled with mud. Two boiler stacks were blown down by the heavy wind and did considerable damage to the portion of the roof on which they fell. The oil house was washed away and an ice house in the vicinity was also damaged.

RESTORING THE LINE

The storm moved from west to east. It struck Emmetsburg, 200 miles west of the Mississippi, at 2 p. m., and between 3 o'clock and 5 it was raging at Mason City, with heavy rain and hail. It did not reach North McGregor until 7 and lasted until about 10 p. m. By 8:40, before the storm was over at North McGregor, a work train had started east from Mason City to commence repairing the damage. The telegraph wires were down for long distances and the lack of telegraphic communication interfered seriously in the task of organizing the repair work. In fact, it was necessary to carry on the work independently from each end of the damaged district.

Men and equipment were moved in from all available points. Extra gangs at work on several adjacent divisions were assembled and together with all section gangs in the immediate vicinity, they totaled over 600 men. Material for pile trestles was immediately sent in from all storage points within a reasonable distance, and as soon as a reconnoissance could be made to determine the amount of trestle required, the estimate was checked up against the material as fast as it was delivered and requisitions were made for whatever additional material was required. Several pile drivers were sent in, but as only one could be used at each end of the break, the others were held for emergency use. The drivers actually used were kept at work continually by crews working in two shifts.

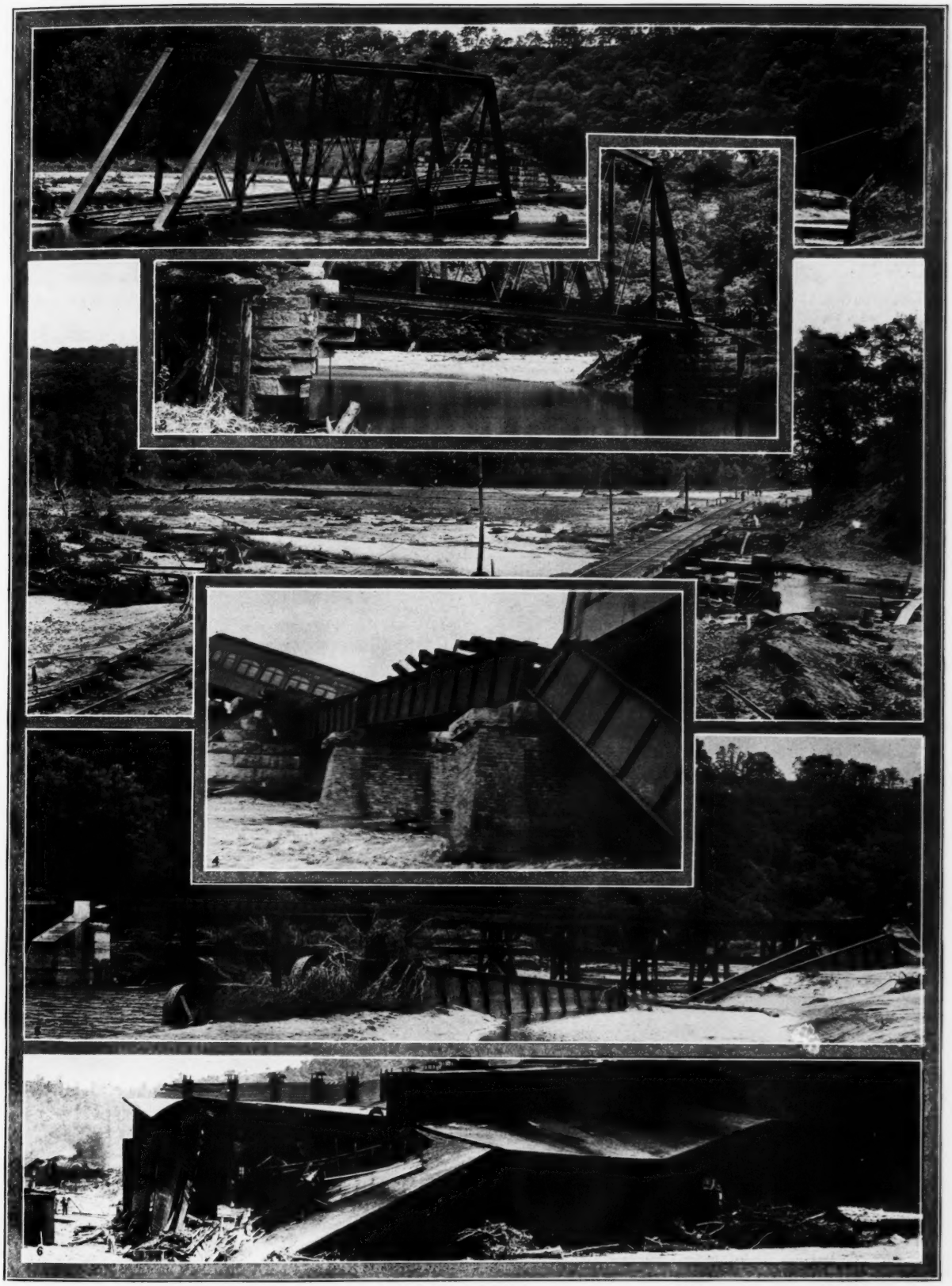
In the 100 miles between Mason City and Valdora, 14 miles west of North McGregor, the destruction wrought was not particularly serious. The repair work in this territory was carried on quickly, and the line was open from the west as far as Beulah (nine miles west of North McGregor) by June 5, but nearly a week longer was occupied in opening the line on the remaining 9 miles. The track was restored where possible, without building trestles, by blocking it up sufficiently to permit the drivers to pass to the next serious break. In all, 1,500 ft. of pile trestle was built in the 14 miles.

As soon as the progress with the drivers permitted, work was commenced on the filling in of the trestles and the repairing of the track where it had been blocked up temporarily. To expedite this work a steam shovel was transferred from Waukesha, Wis., to a pit 5 miles east of North McGregor on the Wisconsin side, where it started work on June 5. Later another shovel was installed in a pit at Plymouth, Iowa, 130 miles west of the Mississippi. It is estimated that 35,000 to 40,000 cu. yd. of filling will be required to restore this line.

PROVISION FOR FLOODS

No storm of a severity approaching that of June 1 had occurred in this region since the flood of 1896, which carried away many of the bridges and resulted in the loss of several lives. Many of the present structures on this line were built at that time to replace the structures then destroyed, after a careful study of the flood conditions to determine what reasonable measures could be taken to prevent a repetition of the damage at some later date. Considerable interest naturally attaches to the present situation with respect to measures which might possibly have been taken to avoid the damage recently done.

By far the greatest damage was done by the washing out of embankments. The flood water virtually filled the



PHOTOGRAPH NO. 4—ROCK ISLAND BRIDGE NEAR PACKARD, IOWA; OTHERS OF ST. PAUL LINE WEST OF NORTH MCGREGOR, IOWA. FIG. 3 SHOWS GIRDERS CARRIED 500 FT. TO POSITION AT LEFT OF PHOTOGRAPH

valley from side to side, covering the track for long distances. A relocation of the line to keep the grade above the flood level would have required heavy construction and an investment of many times the cost of repairing the damage done by the flood.

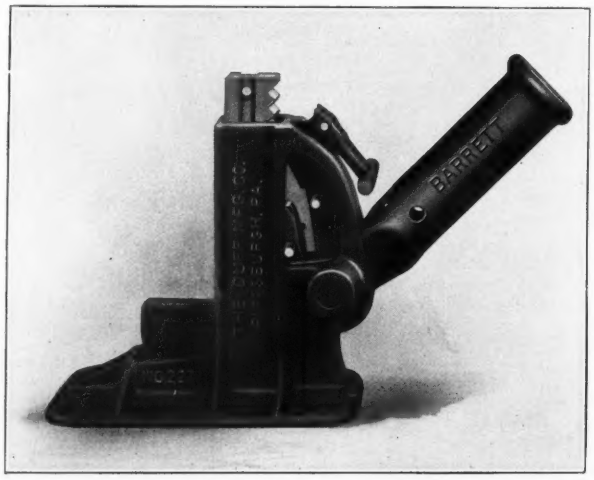
With the line on its present location and the embankment subject to overflow, the question arises as to the security of the bridges. In only two structures was the superstructure carried away or displaced from the masonry by the flow of water or pressure of the drift material, although the water was over the tracks on a great many of the bridges. In four of the structures out of the 30 the sub-structures suffered more or less serious settlement or disintegration and in one case the pier was carried entirely away.

The security of the sub-structure is a matter of foundations and workmanship and an examination since the storm discloses the excellent character of the masonry, most of which was ashlar stone, built just preceding the general introduction of concrete for railroad masonry, on natural cement footings with natural cement mortar for laying the stone work and Portland cement mortar for the copings. In several cases heavy overhangings of masonry are supported merely by the tensile strength of the mortar. With the advantage of monolithic structures now possible in concrete construction, the security of the abutments and piers under similar conditions would no doubt have been considerably better.

The foundations for these bridges were a serious problem, the underlying material being a hardpan in which it was impossible to drive piles. Excavation in this was expensive because all of the material had to be loosened with picks before it could be removed. Under such circumstances the depth of foundations was purely a matter of the best possible judgment.

A SMALL-RAISE TRACK JACK

A NEW small-raise track jack has just recently been introduced to meet the demands of the maintenance officers of some railroads for a track jack that gives only a small raise and which is also sufficiently light to permit

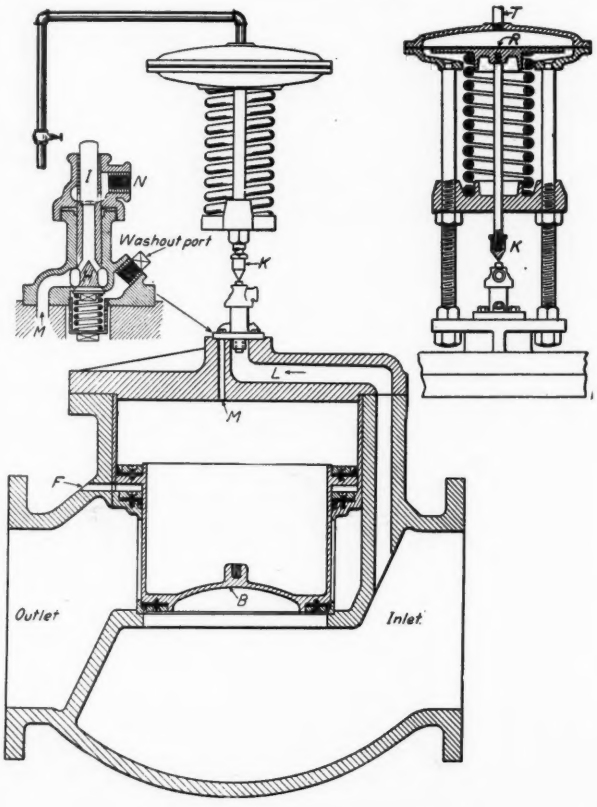


BARRETT JACK.

it to be carried easily by one man. It is known as the No. 227 10-ton track surfacing jack and is made by the Duff Manufacturing Company, Pittsburgh. It is 9½ in. tall over all with a 5½-in. runout and weighs 35 lb. The jack is so low that when tripped it can be left in position under the rail while trains pass. The base of the jack is of a new Barrett type, reinforced with ribs. It also has a carrying handle. The rack and the toe forging are of special carbon steel, the teeth are machine cut and the fulcrum pin is of chrome nickel steel.

AN AUTOMATIC ALTITUDE VALVE

VALVES designed for the automatic control of the water level in tanks or for the regulation of pressure have received extended use in connection with the water service layouts at engine terminals and other railway installations. The Golden-Anderson Valve Specialty Company, Pittsburgh, which manufactures valves of this type, has introduced improvements from time to time which are designed to make these valves applicable under various conditions of service. Among these special applications may be mentioned an electric solenoid at-



IMPROVED CONTROLLING VALVE

tachment for use where remote control is desired. Another modification provides for cutting the tank out of service when a higher pressure is applied to the supply line as in case of fire.

The device in its simplest form is shown in the accompanying drawing which is a sectional view of the main valve in the closed position. If water is drawn from a tank, standpipe or reservoir, the pressure is removed from the top of the diaphragm "R," through the pipe "T" which connects into the outlet side of the valve. This causes the valve spindle "K" to rise, allowing the high pressure auxiliary valve "H" to close, while the exhaust valve "I" is opened, permitting the water above the piston or valve "B" to escape through the passages "M" out of the port "N." The pressure above the valve being removed, the water underneath the piston "B" forces it open.

When the water in the tank reaches the desired height, the pressure, entering through the small pipe "T," is

distributed on the top of diaphragm "R," closing the exhause valve "I" and opening the high pressure valve "H." This allows the initial pressure to come on the valve "B," through the ports "L" and "M." Because there is a greater area on the top of the valve "B" it is forced to its seat, shutting off all the water.

AN AUTOMATIC CROSSING GATE

AN automatic gate for grade crossing protection has been in experimental service on the Chicago & Eastern Illinois at Hoopeston, Ill., since September 25, 1915. In the first six months of service the gate was operated nearly 8,000 times with seven failures, the majority of which occurred during the first few days after the gate was installed. The highway at this point crosses three tracks, two of which form the double-track main line, the third being a passing siding. A recent typical daily report sheet showed 52 train movements for which gate operations were necessary, and 46 vehicles using the crossing.

The mechanism is controlled by setting sections in the track, the circuits on the main line tracks being arranged on the open circuit principle, and on the passing track on a closed circuit. Either arrangement can be used, as desired. On the main line, three rails in each track are insulated for setting sections, one at the crossing and one 1,500 ft., in each direction from it. A track instrument located 2,000 ft. from the crossing on each of the main tracks in the direction from which trains normally approach closes a circuit through a bell mechanism, giving a warning some time before the gates are operated. The bell continues to ring until the train has reached the crossing. It requires from 8 to 10 seconds after the train passes the setting section, 1,500 ft. from the crossing, for the gate to operate to the closed position. If in spite of the bell warning, a vehicle should be caught on the tracks between the gates, the same procedure is possible as with

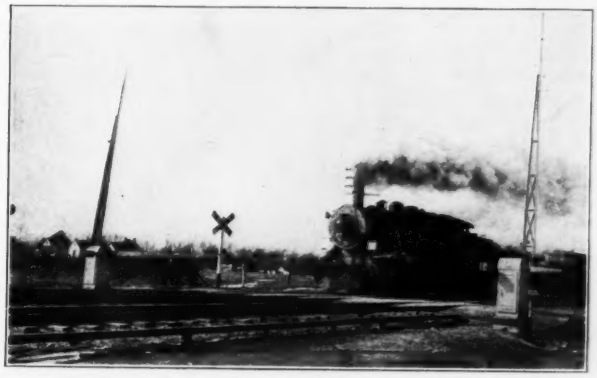
THE GATES RAISED

ordinary gates, either to drive through them or raise them by hand. The gates are accurately counter-weighted, making the latter action easy. It is also feasible to place the gates far enough back to allow room for a vehicle caught on the crossing to stand between the track and the gate. In addition to the bell, a red light is displayed on the gate at night. The light circuit is connected through an operating clock arranged to throw the light in service at a definite time in the evening, and to cut it out at a definite time in the morning.

The gate-operating mechanism is located in enclosed cases on each side of the track on which the gates are mounted. Each of these cases supports two gates, one on each side of the track being operated by each of the mechanism units. The operation of the arm across the tracks from the mechanism is accomplished by means of shafts located below the ties.

The control circuits are said to take care of all conditions arising at this crossing, such as trains moving against the current of traffic; long freight trains approaching the crossing, stopping in the circuit, leaving part of the train in the circuit and passing over the crossing into the yard for some time; trains backing into the circuit and never reaching the crossing; and trains on all three tracks at the same time.

The gates are motor-operated through gearing, the



GATES IN LOWERED POSITION

power being supplied by 30-volt, 50-a.h. storage batteries. The operating circuits are broken through circuit breakers actuated by the movement of the gate.

The mechanism has been maintained by the signal organization and has required no more care than would be expected from equipment in an experimental stage. The storage batteries are recharged every 35 to 50 days. The annual cost of maintenance, aside from breakage, is estimated at $75 to $100 a year. The initial cost would be about the same as the annual cost for the protection of a dangerous crossing by watchmen, both day and night. The gate is patented by Jay Briggs, Hoopeston, Ill.

INCREASING COSTS OF MATERIALS

IN a circular issued by the St. Louis & San Francisco on June 1, it is stated that materials and supplies at the current prices of March 13, 1916, had advanced 53.6 per cent over the 1915 prices, and on June 1, 1916, the prices of these same materials and supplies, excluding fuel, rails and ties had made a further advance of 10.1 per cent, or a total increase of 63.7 per cent over 1915 prices.

The following amended list of articles and the percentages of increases over 1915 prices will be of interest to maintenance of way officials:

Article	Per Cent
Track bolts	112
Steel bridges	187.4
Drills	241.7
Gasoline	172.6
Galvanized iron	93.2
Square and hexagon nuts	158.3
Track spikes	117
Metal tie plates	146
Portland cement	75
Track frogs	18
Rail joints	37.5
Paints	27.7
Sand	40
Shovels	35

THE ROADMASTERS' CONVENTION

PLANS for the next annual convention of the Roadmasters and Maintenance of Way Association are developing rapidly. At a meeting of the entertainment committee, held on June 17, the general outline of the program was adopted.

The convention will be called to order at the McAlpin Hotel, New York, at nine o'clock on Tuesday, September 19. The entire day, with an evening session, will be devoted to the routine business of the association and to the discussion of committee reports. The consideration of reports will be continued on Wednesday forenoon. In the afternoon an inspection of the western end of the Long Island Railway will be made by special train, the party returning in time for a business session in the evening. Thursday morning will be devoted to the further consideration of committee reports, while in the afternoon a special train will conduct the members and guests over the main line of the New York, New Haven & Hartford between Grand Central Terminal, New York, and Stamford, Conn. On Thursday evening the Track Supply Association will give a banquet for the members of the association and a theater party for the ladies. Friday morning will be devoted to a business session of the association and an inspection of the exhibits of the Track Supply Association. In the afternoon the Central Railroad of New Jersey will give the members and guests a trip by boat and rail down the Hudson river through New York harbor to Sandy Hook and Atlantic Hylands, thence by train to Asbury Park and returning to New York.

The outlook for a large and instructive exhibit for the Track Supply Association is excellent. At the present time applications have been received from 46 firms, a larger number than at this date, on any previous year. The following firms have made application for space up to June 20:

Ajax Rail Anchor Co., Chicago, Ill.
Ajax Forge Company, Chicago, Ill.
American Hoist & Derrick Co., St. Paul, Minn.
American Steel & Wire Company, Chicago, Ill.
American Valve & Meter Co., Cincinnati, Ohio.
Carborundum Co., Niagara Falls, N. Y.
Carnegie Steel Co., Pittsburgh, Pa.
Crerar Adams & Co., Chicago, Ill.
Creepcheck Co., New York City.
Duff Mfg. Company, Pittsburgh, Pa.
Elliott Frog & Switch Co., East St. Louis, Ill.
Empire Railway Appliance Corporation, New York City.
Fairbanks Morse & Company, Chicago, Ill.
Frictionless Rail, Boston, Mass.
Hayes Track Appliance Co., Richmond, Ind.
Hauck Manufacturing Co., Brooklyn, N. Y.
Indianapolis Switch & Frog Co., Springfield, Ohio.
Ingersoll Rand Co., New York City.
John Lundie, New York City.
Keystone Grinder & Manufacturing Co., Pittsburgh, Pa.
Lackawanna Steel Company, Buffalo, N. Y.
M. W. Supply Co., Philadelphia, Pa.
Madden Company, Chicago, Ill.
Mitchell Rail Anchor Co., Louisville, Ky.
Morden Frog & Crossing Works, Chicago, Ill.
Mudge & Company, Chicago, Ill.
National Lock Washer Co., Chicago, Ill.
National Malleable Castings Co., Cleveland, Ohio.
Norton Company, Worcester, Mass.
P. & M. Company, Chicago, Ill.
Positive Rail Anchor Co., Marion, Ind.
Pocket List of Railroad Officials, New York City.
Q. & C. Company, New York City.
Rail Joint Company, New York City.
Railroad Supply Co., Chicago, Ill.
Railway Review, Chicago, Ill.
Ramapo Iron Works, Hillburn, N. Y.
Reading Specialties Co., Reading, Pa.
Sellers Mfg. Company, Chicago, Ill.
Simmons Boardman Publishing Co., New York City.
Southern Railway Supply Co., St. Louis, Mo.
Templeton, Kenly & Co., Chicago, Ill.
Track Specialties Company, New York City.
Union Switch & Signal Company, New York City.
Verona Tool Works, Chicago, Ill.
Wyoming Shovel Works, Wyoming, Pa.

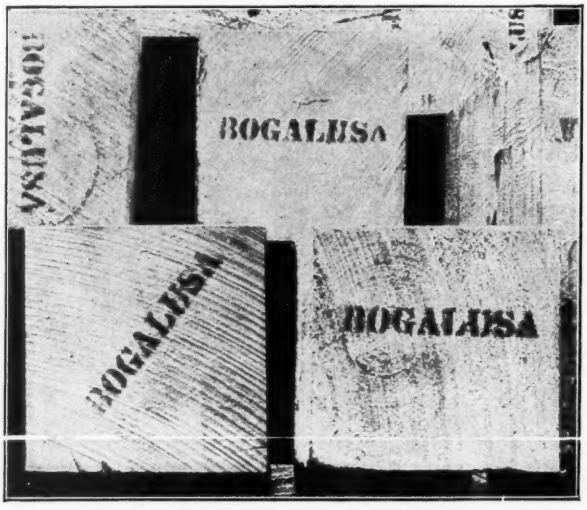
BRANDING LUMBER AT THE MILL

AFTER a number of years, a growing sentiment on the part of the lumber manufacturers in favor of the trade-marking of lumber has crystallized into definite action. The Southern Cypress Manufacturers' Association has adopted this practice and other lumber associations are either formulating plans for carrying it into effect or have the matter under serious consideration. In addition to this a few manufacturers have commenced to mark lumber as individuals and it is expected that others will follow their example.

The trade-marking of lumber is one method that will be used by the lumber manufacturers in their campaign to secure the proper recognition of their product for those purposes for which it is best suited and to establish a reputation for fair dealing and standardized products. As carried out by the Cypress Manufacturers' Association each piece will bear the name of the association and a number designating the mill where the stick originated. By bringing the name of the association or individual manufacturer to the notice of the user a closer relation between them is brought about which will encourage the user to bring to the manufacturer's notice any irregularities from which he has suffered.

In the case of the association mark, each mill is identified and any objectionable practice by the mill or by the jobber can be quickly run down. A strict compliance with the association regulations will soon create a reputation for the trade-marked lumber which will mean a return to the manufacturer far in excess of the expense entailed in marking.

One advantage of this system lies in the fact that it will mean as much to the small producer as to the large-



THE BOGALUSA BRAND

est. Any mill which will conform to the regulations of the association can share in the reputation which the marked lumber will enjoy. A few of the larger manufacturers have recently begun the practice of branding their product with individual trade-marks, thus establishing reputations for the individual manufacturers rath-

er than the associations. Trade-marks of this kind are shown in the accompanying photographs.

There have been cases in the past where the producer and user have suffered alike from irregular practices on the part of the middleman, who has sold lumber as belonging to a higher grade than it classified according to the manufacturers' grading rules. It is apparent from this that the marking of the grade of the lumber would be a desirable addition to the brand. It has, however,

THE NEWMAN BRAND

been found impossible thus far to work out any practicable scheme for doing this. The rules for grading are not uniform in all localities and much lumber is used for purposes requiring special gradings or selections. Another objection arises from the possibility of some change in the grading of individual sticks after they have been graded at the mill because of the disappearance of some defects and the appearance of new ones, through changes of temperature, humidity or other causes while the material is en route.

However, with the trade-mark clearly shown on the stick the purchaser can readily trace down any irregularities in the grading. It is also entirely possible that select structural material classed as dense southern yellow pine according to the recently adopted classification, will be placed on the market branded as to grade.

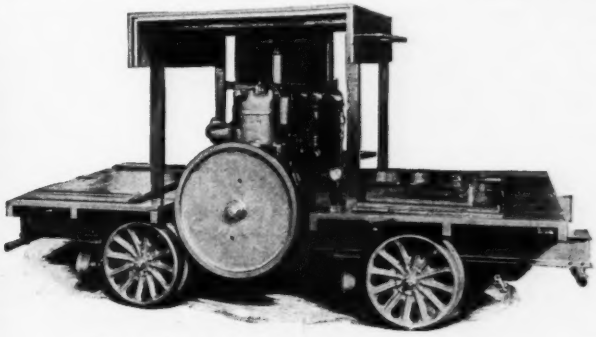
The accompanying photographs show two schemes for branding the lumber: one on the side and the other on the end. The latter is the favored practice and is executed automatically by a machine as the lumber leaves the trimmer table, the marks being a combination of an impression in the fibres and an ink mark. When the prices are branded on both ends the ink is commonly used on one end only. Marking the sticks on both ends simplifies the process and has the advantages that the piece is still identified after one end has been cut off and when the lumber is piled the marks will always be visible on the ends of all the sticks exposed on any side. The minimum size which it has been found practicable to mark is 1 in. by 3 in.

The trade-marking of lumber will work to the advantage of the reputable dealers and to the disadvantages of the unscrupulous. With this impetus to fair dealing the gain to the purchaser should be great, particularly to a large purchaser such as a railroad, whose requirements are not only diversified but exacting.

AN ENLARGED TIE TAMPING OUTFIT

THE Ingersoll-Rand Company, New York, has recently placed a compressor car on the market designed to provide air for four Imperial tie tampers. It is similar in make-up and detail to the two-tool car previously introduced, except that it has a 20-hp. engine with a compressor capacity of 88 cu. ft. of free air per minute instead of a 12-hp. engine and a compressor capacity of 45 cu. ft. of free air per minute, provided in the smaller car. The car complete is also about 50 per cent heavier.

The car has a width of 5 ft. 10 in. and a length of 11 ft. 6 in. The direct-connected engine and compressor



THE ENLARGED TIE TAMPING OUTFIT

are housed in a closed box with removable sides, placed in the center of the car and leaving ample platform space on both ends to carry the tools and the crew. The car is self-propelled through the medium of a lever-controlled clutch on the engine. Both the engine and the compressor are lubricated automatically by means of a splash system. The compressor is cooled by water from the engine radiator. To facilitate moving the car on or off the track, a set of cross trucks is provided.

Aside from the car, the complete outfit includes four of the pneumatic tie tampers, each fitted with a tamping bar and two 300-ft. hose units. A set of lifting jacks is also furnished to assist in removing the car from the track and replacing it.

A HOME-MADE RAIL LOCK INDICATOR

THE accompanying drawing shows a home-made switch for a rail lock indicator on a draw span, which was made and installed on a bridge after it was in service, no indicator having been provided when the bridge was built. The draw span is 400 ft. long, and the

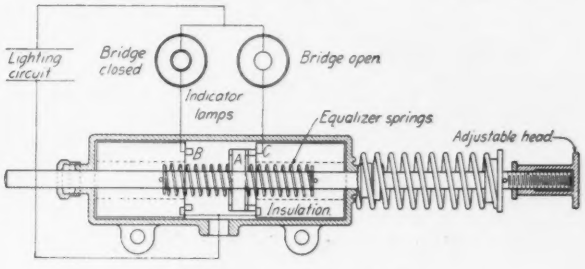


DIAGRAM OF INDICATOR

operating cab is suspended above the tracks in the center of the span, so that the rail locks are 200 ft. away from the operator. While each end of the draw is illuminated with a 100-watt lamp; during dark nights, especially in bad weather, the operator cannot see readily if the rails are in line when the bridge is being closed.

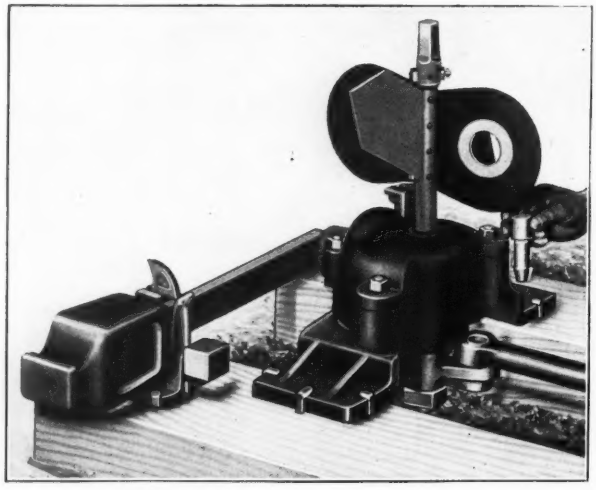
The various functions of closing and opening the bridge are not interlocked to insure proper sequence of operation and the completion of each function before commencing the next one, but light indicators were provided in the operator's cab to show when the end jacks are in or out. As there is no indicator for the end latch, it is possible for the operator to extend the jacks when closing the bridge without having the bridge and rails properly lined up.

To overcome this, the switch shown in the drawing was designed and mounted horizontally between the track rails, parallel to the center line of the track, the rail locks working horizontally. It consists of a cast iron case containing a movable rod on which a contact disc is mounted between two springs. On one end of this rod, projecting outside of the casing is an adjustable head separated from the casing by a coiled spring. This head is placed so that it is moved to the left when the rail locks are thrown into position, compressing the spring and forcing the contact disc against the terminals B. This completes a circuit and lights a green indicator lamp in the operator's cab. When the rail locks are opened the adjustable head is released and forced to the right by the spring, bringing the contact disc in contact with the terminals C. This completes the circuit to light a red indicator lamp in the operator's cab. Springs are provided in the inside of the case to permit overrun of the operating rod, in case the adjustment of the contact head is not accurate.

We are indebted for this information to J. G. Koppel, Sault Ste. Marie, Mich.

A QUICK-REPAIR SWITCH STAND

A SWITCH which has been run through is always a source of annoyance because of the expense involved in bent rails or broken stands and because it ties up the traffic until repairs can be made. This difficulty is overcome in the Anderson quick-repair switch stand which is provided with a single easily-breakable part which



THE ANDERSON SWITCH STAND.

will be destroyed quickly when the switch is run through, thereby preventing damage to any other parts. It provides also for quick renewal of the broken part so that the switch need be out of service only a very short time.

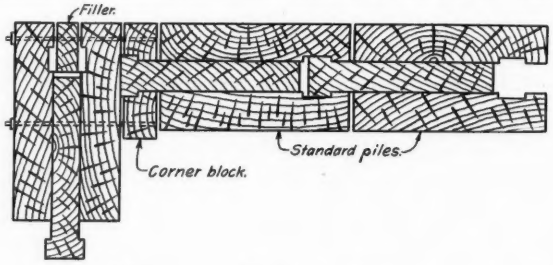
This switch is of the parallel throw type and is equipped with a crank pin, which is necked down at the point where it passes from the hole in the crank to the one in the crank rod, so that it is easily broken when a pressure is applied on the crank rod and the throwing lever is locked. A new pin can be placed in five minutes by any track laborer at a cost of 15 cents for the new pin. Each switch stand is sent out with two pins, the extra one being held in a small lug on the back of the crank, where it is always ready for use. This crank pin is self-locking, being provided with a small lug on one side of the lower end, which is tapered to permit its ready entrance into the holes in the crank and the crank rod, but which prevents its removal. As the end of the connecting rod is under the switch stand housing, it is held down so that it is impossible for the rod and arm to become disconnected unless the crank pin is broken.

Another feature of this switch stand is the throwing lever, which is forged in one piece with the pinion shaft. The housing is designed to afford protection from dirt, ice and snow. This switch stand is made by the American Valve & Meter Company, Cincinnati, Ohio, and has been used on a number of important railroads.

A NEW SHEET PILING

AN improvement of the common Wakefield sheet piling has been devised which provides a positive interlock like steel sheet piling. As shown in the accompanying drawing, the two outside members of each unit are milled or grooved longitudinally on the inside of the mortise to receive projecting lugs on the tenon of the middle piece. Sufficient clearance is provided to prevent binding, but the fit is close enough to insure a watertight cofferdam. The drawing also shows the detail of the corner units.

This sheet piling has been used on government levee work in the South. A typical installation on the fourth levee district on the Mississippi river involved 857 lineal feet of bulkhead, with a total cost of $4,309.76, of which



METHOD OF TURNING CORNER.

$1,328.27 represented the cost of driving. These piles were all heart long leaf yellow pine, and were 5½ in. thick by 20 ft. long, and were driven full length by a 2,350-lb. drop hammer, with a fall of 12 ft., at an average of 80 blows per pile. No difficulty was experienced, except where a few buried logs were encountered.

These piles were used recently by the Louisiana Railroad & Navigation Company for a water-tight bulkhead 250 ft. long at New Orleans. The piles were 4½ in. net thickness and 24 ft. long, with a 16-ft. penetration. For a distance of 150 ft. the piles were driven through the remains of an old barge without drifting, shattering or otherwise injuring them. The accompanying photograph shows a pile driver at work on the cofferdam for a bridge pier at New Orleans. The sheet piles were 5½ in. thick by 30 ft. long.

This sheet piling is made of long leaf yellow pine by the J. J. Newman Lumber Company, Hattiesburg, Miss., and is known as the Martinez interlock sheet piling. The piles are furnished knocked down. One cent per lineal foot of pile is said to cover the cost of labor and nails to assemble them.

GENERAL NEWS DEPARTMENT

The Kentucky Court of Appeals holds that a section hand assumes the risk of falling off a hand car because of its being overcrowded, where the conditions are open and obvious, he being aware of them when boarding it, not complaining and not being directed by the foremen to board the car in spite of its condition.

In a damage suit for $34,000 brought against the Chicago, Milwaukee & St. Paul by a conductor who had been dismissed from service when it was found he used intoxicants, Judge A. Van Valkenburgh of the United States District Court at Kansas City declared that, "it is the duty of a railroad to the public it serves to protect its patrons by discharging men who use intoxicants."

According to a statement issued by Thomas W. Hulme, general secretary of the Presidents' Conference Committee on the federal valuation of the railroads, 64,793 miles of line of road and track have been inspected and inventoried up to May 31, 1916. The federal parties had also covered the bridges on 40,112 miles of line and had inspected "adjacent similar lands" on 29,495 miles of line previous to that date.

In a case against the Chicago, Milwaukee & St. Paul, the Wisconsin Supreme Court has decided that the work of preparing articles for interstate commerce is not a part of such commerce within the meaning of the federal employers' liability act. In the case under consideration an employee of the railroad was killed at Tomah, Wis., by a pile of lumber falling upon him, the lumber being used in the manufacture of articles used by the road.

The Boston & Maine has granted an increase of five per cent in wages to such of its employees outside of the "Big Four" brotherhoods who have not had advances recently, and who are not being paid more than the prevailing wages for similar work in eastern New England. The increase will add about $800,000 a year to the Boston & Maine payrolls. It has been accepted by several of the unions that have taken strike votes to enforce recent demands upon the road.

The Texas Court or Civil Appeals holds that the custom of the railroads to make deductions from the wages of its employees in favor of persons having claims against them in accordance with a statement in a time book, constituting an order upon the company and signed by the employees, which action was taken for the accommodation of the employees and without consideration, does not constitute an assumption of primary liability by the railroad for goods sold to a section gang at the request of a section foreman.

The Norfolk & Western has notified employees that, except where important interests of the company interfere, anyone wishing to take his vacation this year at Camp Oglethorpe, Ga., for military training will be allowed a month with pay. This is an experiment as the company believes that large employers of men ought to encourage military training. An officer of the company states that only two employees took advantage of the company's offer for the May encampment; one a man from the general office, and the other a conductor on the Norfolk division.

On Sunday, June 4, the officers of the Bangor & Aroostook invited about 1,500 of the employees to attend a "good-will meeting" at Houlton, Me., special trains being run from all of the divisions of the road. Before the meeting was called, the brakemen and the telegraphers, who belong to brotherhoods, held meetings of their own organizations. At the general meeting Percy R. Todd, president of the road, announced that a cash bonus of four per cent of the wages received during the 12 months ending June 1, 1916, would be paid at once to each employee receiving less than $2,000 a year. The enginemen and firemen of this road are non-union, nearly the whole force having been recruited since January, 1913, when the brotherhood men declared a strike. Most of the shopmen and clerks are also non-union, while the conductors, brakemen, station men and section men belong to the unions. It is said that none of the employees of this road are taking part in the present movement for an eight-hour day, though president Todd in his address took occasion to repeat his former declaration that the company is not opposed to labor unions.

The Mississippi Supreme Court holds that, where a railroad company properly acquired a parcel of land for a right of way, and the contour of the land rendered a cut necessary, the road is not liable to the grantee of the owner of the land for injuries caused by the slipping of the land into the cut, the lateral support being removed. The original grant of the right of way necessarily included a right to make the cut and remove the lateral support. When a right of way is condemned or bought, it is held that the right to do any and all things necessary and proper in the use of it is presumed to have been paid for.

The Nebraska Supreme Court holds that, where a section foreman has notice of the railroad's rules requiring him to send a man ahead to look out for a train when approaching a sharp curve in a deep cut on a hand car, the failure of trainmen to give warning of their approach before the presence of the section men is discoverable, is not negligence in the absence of a statute or rule requiring them to do so. The trainmen may assume until the contrary appears, that section men will obey reasonable known rules promulgated for the safety of themselves and others and that where a foreman breaks the rules and is killed on failing to jump from the car before being struck, no recovery can be had for his death.

In an action of mandamus by a landowner to compel a railroad company whose line ran through his land to construct an undercrossing in place of the existing grade crossing, the railroad claimed that at no place could a crossing of any character be constructed without making the grade so steep that it could not be traveled in any manner; and that to construct an undercrossing where the plaintiff wanted it, even at an unreasonable grade, would cost more than $8,000. The Iowa Supreme Court holds that, on the question whether a grade crossing with proper gates and guards is adequate, the consideration of cost is not a defense, but is a circumstance properly to be considered and neither the expense nor the convenience or profit to the landowner taken alone is necessarily ground for making or refusing an order for an undercrossing. A landowner is entitled not to the most convenient or profitable means of crossing, but to an "adequate crossing," the location and character of which must be determined with due regard for all the interests involved in its construction and maintenance. The court refused to order an underground crossing, but ordered that the railroad place a gate at the existing grade crossing and cut down an embankment to enable an approaching train to be seen.

The labor leaders have secured favorable action by the House Committee at Washington on a bill to make more stringent the hours-of-labor law as effecting signalmen, and to bring within its provisions signalmen at interlocking towers even where they do not send or receive train orders; and the bill is now on the House calendar awaiting action. The bill bears the name of Representative Cullop of Indiana and the House committee has made a favorable report on it. In night-and-day offices the working time-limit is reduced from 9 hours to 8, and the 8-hour term must be one continuous period. On the completion of the 8-hour period the employee must not be required or permitted to go on duty again until the expiration of 16 hours. The provision taking in levermen, which is effective only in towers, stations, etc., which are operated continuously, applies to men who operate "signals or switches or similar mechanical devices controlling, pertaining to, or effecting the movement of trains." Exception is made in the case of accidents, etc., where the telephone must be used to obtain orders, and the law does not apply to railroads where there are not more than two passenger trains daily. On such roads of light traffic, signalmen may work 10 hours in each 24-hour period.

PERSONAL MENTION

GENERAL

G. A. HARWOOD has been appointed engineering assistant to the vice-president in charge of operation of the New York Central, with duties assigned and headquarters at New York. He was formerly chief engineer of electric zone improvements.

ARTHUR D. PETERS, who has recently been appointed division superintendent of the Lake Erie & Western, with headquarters at Lima, Ohio, was born at Springport, Mich., on March 19, 1879. He graduated from the engineering department of the Michigan Agricultural College in 1903, and entered railway service with the Lake Shore & Michigan Southern as a draftsman on February 22, 1906. From September, 1906, until July, 1907, he was in the land and tax department, after which he was real estate agent of the Lake Erie & Western until August, 1903, since which time he has been special engineer.

RICHARD H. AISHTON, who has recently been elected president of the Chicago & Northwestern, was born at Evanston, Ill., on June 2, 1860. He entered the service of the Northwestern in 1878 as an axman in the engineering corps and has been in the employ of this road continuously since that date, advancing through the positions of rodman, levelman, assistant engineer, superintendent of bridges and buildings and division engineer, until June 1, 1895, when he was appointed assistant superintendent. Since that date he has been in the operating department, being appointed general manager in January, 1906, and vice-president in charge of operation and maintenance in November, 1910.

ENGINEERING

SAMUEL MURRAY has been appointed chief engineer of the Oregon-Washington Railroad & Navigation Company, with headquarters at Portland, Ore. Mr. Murray has been acting chief engineer since September 14, 1915, succeeding J. R. Holman, who was granted an indefinite leave of absence at that time.

HENRY C. COSAND has been appointed division engineer and master carpenter of the Chicago, Rock Island & Pacific, with headquarters at Eldon, Mo. Mr. Cosand was born at New Castle, Ind., on September 7, 1877, and graduated from Purdue University in 1904. He entered the service of the Rock Island in the same year as a rodman and instrument man, with headquarters at Topeka, Kan. In 1906, he worked as a draftsman in the Topeka office of the same road. In 1907 and 1908 he was assistant engineer in charge of construction at the Armourdale Yards, Kansas City, Kan. In 1909 he was assistant engineer in the office of the engineer of maintenance of way at Topeka, Kan. He was engineer in charge of construction of new terminal facilities at North St. Louis, Mo., in 1910, and from 1911 to 1914, was office engineer in the office of the engineer of maintenance of way at Topeka. In 1915 he was appointed pilot engineer on government valuation work in Missouri, Kansas and Colorado. He was made division engineer of the St. Louis division on January 1, 1916, and on May 21 was also appointed master carpenter. His entire railroad experience has been with the Rock Island.

HENRY C. COSAND

J. A. GILLIES has been appointed engineer of the southern district of the Atchison, Topeka & Santa Fe, western lines, with headquarters at Amarillo, Tex.

S. W. BRADY, who has been temporarily engaged in federal valuation work, has resumed his duties as engineer of the Beaumont division of the Gulf, Colorado & Santa Fe, with headquarters at Beaumont, Tex., taking the place of G. A. Knapp, who has been acting in that capacity.

TRACK

R. M. BARRETT, supervisor of the Wellsville & Buffalo at Arcade, N. Y., has been appointed roadmaster, with headquarters at the same point.

J. W. THOMAS has been appointed roadmaster of the Norfolk & Western, with headquarters at Wilcoe, W. Va., succeeding J. B. McConnell, transferred.

C. B. M. LONG has been appointed track supervisor of the Baltimore & Ohio, with headquarters at Holloway, Ohio, in place of W. A. Hennen, transferred.

I. J. KILBURN has been appointed roadmaster of the Colorado division of the Atchison, Topeka & Santa Fe, with headquarters at Pueblo, Colo., succeeding J. P. Costello, promoted.

PAUL KIRKBRIDE has been appointed assistant roadmaster of the Norfolk & Western, with headquarters at Williamson, W. Va., succeeding C. P. Yost, assigned to other duties.

CHARLES SAXON has been appointed roadmaster on the Peninsular division of the Chicago & Northwestern, with headquarters at Iron Mountain, Mich., vice George Mathiason, resigned.

J. P. COSTELLO, roadmaster of the Colorado division of the Atchison, Topeka & Santa Fe, with headquarters at Pueblo, Colo., has been promoted to inspector of track, western lines, with headquarters at La Junta, Colo.

G. W. HUFFMAN has been appointed supervisor of the Baltimore & Ohio at Ravenna, Ohio, vice F. C. Green, transferred. E. Landis has been appointed supervisor at Rowlesburg, W. Va., vice G. W. Huffman, transferred.

EDWIN L. HOOPES, who was recently promoted to supervisor on the Tyrone division of the Pennsylvania Railroad at Osceola Mills, Pa., was born September 2, 1882, and after graduating from Princeton, entered the service of the Pennsylvania on June 12, 1905, as chainman. In April, 1910, he was appointed assistant supervisor at Verona, Pa., being transferred on July 1, 1912, to Mt. Holly, N. J., and on July 1, 1913, to Perryville, Md.

T. H. HICKEY has been appointed track inspector of the Michigan Central, with headquarters at Detroit, Mich. He was born in Ireland on October 2, 1852, and first entered railway service in 1872, with the Ft. Wayne & Jackson. In 1881 he entered the employ of the Michigan Central as an extra gang foreman and one year later was promoted to assistant roadmaster on the Eastern division. He was promoted to division roadmaster in 1884, and in 1892 was transferred in the same capacity to the Canadian division, with headquarters at St. Thomas, Ont.

GEORGE M. BALL, JR., supervisor of the Pennsylvania Railroad at Jersey City, N. J., has been transferred to Washington, D. C., succeeding Robert Faries, transferred to Baltimore. Jerry Bergan, supervisor at Elmira, N. Y., has been transferred to the office of the division engineer at that point. F. J. Potter, supervisor at Bordentown, N. J., has been transferred to the office of division engineer at Trenton, N. J. W. W. Springer, supervisor at Earnest, Pa., has been transferred to Baltimore. A. E. Preble, supervisor of the Camden Terminal division and the West Jersey and Seashore, with headquarters at Camden, N. J., has been transferred to Bordentown, being succeeded at Camden by Joseph H. Reading, supervisor at Baltimore. Thomas E. Lightfoot, supervisor at Reading, Pa., has been transferred to Erie. W. D. Cornwell, supervisor at York, Pa., has been transferred to Elmira, N. Y. F. M. Robb, supervisor at Osceola Mills, Pa., has been transferred to Oil City, succeeding Harold J. Davall, transferred to Jamesburg, N. J. Wm. P. Critchfield, supervisor at Kittanning, Pa., has been trans-

ferred to Freeport. R. S. Stewart, supervisor at Trenton, N. J., has been transferred to Kittanning, Pa.

CLARENCE L. FRY, assistant supervisor of the Pennsylvania Railroad at West Brownsville, Pa., has been transferred to Baltimore, succeeding Wendell G. McNees, transferred to West Brownsville, Pa. Herbert H. Kaufman, assistant supervisor on the Philadelphia division, has been transferred to York, Pa. Raymond Swenk, assistant supervisor of the Delaware division, has been transferred to the Camden Terminal division and the West Jersey and Seashore, with headquarters at Camden, N. J., succeeding Joshua F. Hunter, transferred to the Maryland division.

JAMES MCCOY, who was promoted to supervisor of the New York division of the Pennsylvania Railroad at Jersey City, N. J., on May 15, was born at Susquehanna, Pa., September 26, 1862, and entered the service of the Pennsylvania on May 25, 1884, as sub-foreman on the New York division. On December 1 of that year he was advanced to track foreman, and on February 1, 1909, he was promoted to the position of general track foreman of the Manhattan division. He was appointed assistant supervisor, Manhattan division on November 1, 1912, which position he held until his recent appointment.

J. B. MCCONNELL has been appointed roadmaster of the Norfolk & Western, with headquarters at Portsmouth, Ohio, vice J. D. McNamara, appointed yard foreman at that point. Mr. McConnell was born at Gate City, Va., in October, 1887, and entered railway service as a section laborer on the Norfolk & Western in January, 1904. In March, 1905, he was made assistant foreman of an extra gang and remained in that position until January, 1911, when he was promoted to extra gang foreman. On June 28, 1915, he was appointed roadmaster, with headquarters at Wilcoe, W. Va., and on May 24, 1916, was transferred in the same capacity to the Scioto division, with headquarters at Portsmouth, Ohio.

WILLIAM JOSEPH AGER has been appointed roadmaster of the Northern Pacific, with headquarters at Tacoma, Wash., vice C. W. Fee, promoted to trainmaster at the same place. He was born at Dublin, Ireland, on May 16, 1864, and first entered railway service as a general foreman with the Oregon-Washington Railroad & Navigation Company on June 10, 1902. From September 14, 1903, to March, 1908, he was superintendent of construction of the Spokane Traction Company at Spokane, Wash. He then returned to the service of the O.-W. R. & N. Co. as a roadmaster, remaining in that position until June, 1912. In December, 1912, he entered the employ of the Northern Pacific as an extra gang foreman, and in December, 1915, was made a section foreman on the same road. He was promoted to roadmaster on May 12, 1916, with headquarters at Tacoma, Wash.

BRIDGE

WALTER SCHLINKERT has been appointed supervisor of scales of the Illinois Central, with headquarters at Centralia, Ill., vice Fred Schlinkert, deceased.

CHARLES F. NYE has been appointed supervisor of water service of the Wheeling & Lake Erie, with headquarters at Brewster, Ohio, succeeding Adam Nye, deceased.

W. E. WHITE has been appointed assistant general foreman of the bridge and building department of the Atchison, Topeka & Santa Fe, with headquarters at Chanute, Kan.

J. O. BUTLER has been appointed acting general foreman of the bridge and building department of the Atchison, Topeka & Santa Fe, with headuqarters at Wellington, Kan., vice Ed McCann, who has been pensioned.

CHARLES R. KNOWLES, general foreman of waterworks of the Illinois Central and the Yazoo & Mississippi Valley, has been appointed superintendent water service of these roads, with headquarters at Chicago, Ill., effective June 23.

WILLIAM D. SIGEL has been appointed master carpenter of the Pittsburgh, Cincinnati, Chicago & St. Louis, with headquarters at Xenia, Ohio, vice S. H. Deacon, retired on account of old age. Mr. Sigel was born at Cherry Grove, Hamilton County, Ohio, on August 29, 1864, and attended Normal University at Lebanon, Ohio, in 1880 and 1881. He entered railway service as a carpenter in the maintenance of way department on the Cincinnati division of the Pittsburgh, Cincinnati, Chicago & St. Louis on May 20, 1891. In September, 1900, he was promoted to carpenter foreman on the same division, and on June 1, 1916, he was appointed master carpenter, with headquarters at Xenia, Ohio.

BENJAMIN H. MCNAMARA, recently appointed master carpenter of the Chicago, Rock Island & Pacific at Dalhart, Tex., was born at Marietta, Ohio, on April 20, 1860. He had a common and high school education and entered railway service in the bridge and building department of the St. Louis & San Francisco on May 20, 1890. He was a division foreman in this department until February 1, 1902, when he left the Frisco to become general foreman in the bridge and building department of the St. Louis, Kansas City & Colorado, now a part of the Rock Island. He continued in the same position until October 10, 1912, when he was promoted to master carpenter of the St. Louis division of the Rock Island, with headquarters at Eldon, Mo. On May 22, 1916, he was transferred as master carpenter to the El Paso division, with headquarters at Dalhart, Tex., vice J. M. Beaty, transferred to Fairbury, Neb.

PURCHASING

E. W. THORNLEY, district storekeeper of the Pittsburgh division of the Baltimore & Ohio, has been appointed assistant general storekeeper.

R. A. JACOBS, formerly inspector of stores of the St. Louis & San Francisco, at Springfield, Mo., has been appointed superintendent of the reclamation plant, with headquarters at Springfield, succeeding R. F. Whalen, resigned.

H. J. MCQUADE, recently appointed purchasing agent of the Lehigh Valley, with headquarters at New York, entered the service of the Lehigh Valley as a clerk in the local offices in Philadelphia when a boy, 29 years ago. On February 3, 1902, he was transferred to the general bookkeeping department, and on December 23, 1903, was appointed chief clerk to the general auditor, which position he held until January 20, 1909, when he was elected assistant treasurer, remaining there until June 1, 1910, when he left the service of the Lehigh Valley to assume other duties. He now returns to the Lehigh Valley as purchasing agent of that road.

OBITUARY

CHARLES HOPKINS CARTLIDGE, bridge engineer of the Chicago, Burlington & Quincy, died at his home in Hinsdale (Chicago), on June 14, after a brief attack of pneumonia. He was born at Hannibal, Mo., on April 29, 1869. After receiving a grammar and high school education he entered railway work on the Kansas City, Memphis & Birmingham on July 18, 1886. He was engaged on construction work with this road from November, 1886, to June, 1888, from which time he was employed on land surveys and municipal engineering work at St. Joseph, Mo., until June 26, 1890. On this date he entered the bridge department of the Burlington as a draftsman, being appointed bridge engineer on June 16, 1902. He was also chief engineer of the Paducah & Illinois, a subsidiary of the Burlington, and the Nashville, Chattanooga & St. Louis, organized to build a 12-mile connection between Metropolis, Ill., and Paducah, Ky., including a double-track bridge across the Ohio River. In his work as bridge engineer he was a pioneer in the development of reinforced concrete trestle and culvert construction, using these types largely on work built under his direction.

CHARLES H. CARTLIDGE

CONSTRUCTION NEWS

THE BALTIMORE & OHIO has been asking for bids for the construction of a new open pier at the company's export terminal at Locust Point, Baltimore, the estimated cost being $650,000. The new pier will be 1,000 ft. long and 150 ft. wide, with a water depth of 35 ft. and will have a double track in the center, with a single track on the east side.

The Baltimore & Ohio will soon award the contract for the erection of a steel-frame freight house, 350 ft. long by 35 ft. wide, at Thirty-third street, Pittsburgh.

The Baltimore & Ohio has made plans for new freight facilities to be constructed at Parkersburg, W. Va., at a cost of $300,000. The improvements consist of a modern freight station, transfer platform, team tracks and offices for the division freight and the agency forces. The building will be of brick construction, 500 ft. long by 35 ft. wide, with the office portion of the building occupying the second floor.

The Baltimore & Ohio has received bids for the construction of the Long Fork Railroad in northeastern Kentucky, extending from a junction with the Chesapeake & Ohio Railroad at the forks of Beaver Creek, Floyd County, in a southerly direction to Weeksbury, Knott County, a distance of 26 miles. The line will involve five tunnels from 140 feet to 775 feet in length. The new line will be built to reach a large area of coal lands on which development has been started.

THE BESSEMER & LAKE ERIE will build a large concrete ore dock at Conneaut, Ohio, and has made application to the government for the establishment of a new harbor line.

THE CANADIAN NORTHERN PACIFIC will erect a $1,000,000 freight and passenger terminal at Vancouver, B. C., a freight shed, 800 ft. by 40 ft., and a roundhouse, and will lay approximately 130,000 ft. of track. The grading work, which involves the handling of 4,000,000 cu. yd. of material, is well advanced, and bids for the construction work will be called for soon.

THE CHICAGO & EASTERN ILLINOIS is doing preliminary work on a new passenger station at Danville, Ill., including trackage and sheds, at an approximate cost of $175,000. It is also completing car shops partially built in 1913 at a cost of about $100,000.

THE CHICAGO GREAT WESTERN has awarded a contract to Joseph T. Nelson & Sons, Chicago, for the erection of two buildings at Oelwein, Iowa, to be used as a rail reclamation plant. They will be one-story frame buildings, 34 ft. by 70 ft. and 40 ft. by 96 ft. respectively. The following machinery recently purchased will be installed: One Ryerson No. 3 high speed motor-driven section saw, one drill press, three spindle rail drilling machines with motor drive, one No. 11 Boudry Champion power hammer, one motor drive reverse planer outfit. The buildings with equipment will cost about $8,000.

THE CHICAGO, MILWAUKEE & ST. PAUL is constructing a 500-ft. by 175-ft. extension to its docks at Tacoma, Wash., at an estimated cost of $200,000. The extension is a timber structure with a roof covering and the work is being done by company forces.

THE DETROIT, BAY CITY & WESTERN is building an extension southeasterly from Peck, Mich., its present terminal, to Pt. Huron, 32 miles, to include the construction of one 700-ft. trestle, and 12 small bridges varying from 12 ft. to 30 ft. in length. A depot and a roundhouse are contemplated at Pt. Huron and a new terminal depot at Bay City to cost about $60,000.

THE DULUTH & IRON RANGE has let contracts for the erection of a car repair shop at Two Harbors, Minn., which will be a one-story, steel-frame structure, 275 ft. by 310 ft., with concrete block walls. Strom Brothers of Two Harbors, Minn., have the contract for the foundation work, and the steel work has been ordered from the American Bridge Company. No contract has yet been awarded for the erection of the superstructure.

THE GREAT NORTHERN has awarded a contract to Grant, Smith & Company, Seattle, Wash., for the construction of a 20-stall brick roundhouse, a powerhouse and a 100-ft. turntable at Great Falls, Mont., and a contract to the Howlett Construction Company, Moline, Ill., for a 500-ton coal chute, work now being under way.

THE ILLINOIS CENTRAL is preparing plans for a two-story, brick and concrete passenger station, with tile roof, at Mattoon, Ill., 36 ft. by 150 ft., to cost about $50,000.

The Illinois Central is preparing plans and specifications for a brick freight house at East St. Louis, Ill., 1,050 ft. by 40 ft., 400 ft. of which will have two stories.

THE INDIANAPOLIS UNION has awarded a $125,000 contract to the Ketler-Elliott Erection Company, Chicago, for part of the steel work in connection with the elevation of tracks through the business district of Indianapolis.

THE LEHIGH VALLEY is making improvements at Manchester, N. Y., which include a 30-stall roundhouse, the construction of a machine shop, boiler, engine and oil houses, an office building, a concrete and steel water ash pit, a gravity coal trestle and a 100-ft. turntable. Special electrical apparatus will be installed to operate all of the machinery and light in the yards, and a large compressor layout will be provided for supplying air throughout the yards for testing purposes. Westinghouse, Church, Kerr & Company, New York, have the contract for this work.

The Lehigh Valley will make terminal improvements at Niagara Falls, N. Y., consisting of a 15-stall roundhouse, machine shop, storehouse, engine, boiler and oil house, an office building and a freight house having concrete platforms on either side. An extensive addition to the yard tracks will be necessary, which will include a car repair yard, shops, storehouses, drop pits, a washout system for cleaning engines, a concrete and steel coal pit and water ash pit. The new freight station and the necessary yards will be built near Suspension Bridge.

THE MCCONNELLSBURG & FORT LOUDON desires to receive bids for the building of a railroad from McConnellsburg, Pa., to Fort Loudon, about 11 miles, the plans calling for about 100,000 cu. yd. of excavation work. The maximum grade is 6½ per cent and the maximum curvature 18 deg.

THE MISSOURI, KANSAS & TEXAS is replacing the light spans of its bridge over the Arkansas river at Muskogee, Okla., with heavier ones and is constructing four new piers, the J. W. McMurry Construction Company, Kansas City, Mo., having the contract for the pier construction. The cost of the improvement is estimated at $62,000.

THE NEW YORK CENTRAL AND THE ERIE are now engaged in the elimination of grade crossings at Niagara Falls, N. Y., at an estimated cost of $600,000. Solid-floor steel bridges are to be erected on concrete masonry. A contract has been let to the Fort Pitt Bridge Works for the fabrication of the steel and contracts are to be let by the city of Niagara Falls for the sub-structure and grading work, and also for the paving of the streets.

THE OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY, together with the street railway company of Portland, Ore., have been assessed 60 per cent of the cost of the plans which have been filed with the city authorities, providing for the elimination of grade crossings on the Oregon-Washington Railroad & Navigation Company's line in Sullivan Gulch, which includes the construction of seven permanent and three temporary viaducts. The estimated cost of the structures is $520,000, and of the entire project $600,000. Legal procedure does not permit the asking of bids before the latter part of September or the first of October.

THE PENNSYLVANIA LINES have awarded a contract to Henkel & Sullivan, Cincinnati, Ohio, for the masonry and street work in connection with track elevation between Delta and Stanley avenues, Cincinnati.

THE PHILADELPHIA & READING has awarded a contract to the Atlantic, Gulf & Pacific Company, New York, for the dredging and embankment work for an additional pier at Port Reading, N. J., to facilitate the unloading of coal from cars, while the McMyler-Interstate Company, Cleveland, has the contract for

the car-unloading machinery. A contract has also been let to the Surety Engineering Company, Inc., New York, to build a thawing plant with a capacity of 44 cars at Port Reading.

THE PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS has awarded a contract to Dunn & McCarthey, Chicago, Ill., to construct a new freight terminal at Indianapolis, Ind., which includes the laying of 55 miles of track and the construction of a roundhouse, coaling plant, water station, inspection pits, ash pits, sandhouse, oilhouse, powerhouse, yard office, scales and interlocking towers.

THE SALINA NORTHERN is building an extension 55 miles long from Lincoln Center, Kan., northwest, involving 850,000 cu. yd. of fill, 285,000 cu. yd. of cut, 25,000 cu. yd. of rock excavation, the erection of one 55-ft. deck girder span, three 67-ft. girder spans and four 120-ft. pin-connected truss bridges, the placing of 2,500 cu. yd. of masonry and the erection of 6,400 lineal ft. of trestles.

THE WHEELING & LAKE ERIE will build a three-story, reinforced concrete freight house, 40 ft. by 360 ft., at Canton, O., at an estimated cost of $90,000, and will lay about 1½ miles of track, involving the erection of three bridges. J. C. Carland & Company, Toledo, O., have the contract for the track work.

TRACK MATERIALS

THE CHICAGO, INDIANAPOLIS & LOUISVILLE is making inquiries for 1.000 kegs of spikes.

THE CHICAGO GREAT WESTERN has ordered an additional 1,000 tons of rails from the Illinois Steel Company.

THE ILLINOIS CENTRAL has ordered the following track specialties for its requirements during the ensuing year: 20,000 tons of tie plates, 30,000 pairs of angle bars, 20,000 kegs of track spikes and 45,000 kegs of track bolts.

STRUCTURAL STEEL

THE CHICAGO, MILWAUKEE & ST. PAUL has ordered 111 tons of steel from the Wisconsin Bridge & Iron Co., Milwaukee, for use in the Lake street and South Water street subways, Milwaukee.

THE CENTRAL OF NEW JERSEY has ordered 400 tons of bridge steel from the McClintic-Marshall Company.

THE LEHIGH VALLEY has ordered 1,600 tons of structural steel from the Phoenix Bridge Company.

THE NEW YORK CENTRAL has ordered 850 tons of steel from the Fort Pitt Bridge Works for grade crossing elimination work at Niagara Falls, N. Y.

The New York Central has ordered 300 tons of steel from Terry & Tench for a viaduct on Vanderbilt avenue, between Forty-eighth and Forty-ninth streets, New York.

THE PENNSYLVANIA RAILROAD has ordered 1,200 tons of bridge work from the Pennsylvania Steel Company.

The Pennsylvania Railroad has ordered 150 tons of steel from Lewis F. Shoemaker & Company, and will soon place orders for 350 tons of steel for six bridges and 300 tons for a subway connection at the New York station.

The Pennsylvania Railroad has ordered 2,600 tons of bridge steel from the Fort Pitt Bridge Works and 1,800 tons from the Phoenix Bridge Company.

THE PHILADELPHIA & READING has ordered 200 tons of steel for a bridge at Pottstown, Pa., from the American Bridge Company.

THE SOUTHERN RAILWAY has ordered 500 tons of steel from the McClintic-Marshall Company for an office building at Washington, D. C.

ACCORDING to current reports, the Russian Government is negotiating for over 300,000 tons of steel rails for delivery late in 1916 and early in 1917. It is understood that approximately one-half of this order has already been taken by the United States Steel Corporation.

THE WABASH has ordered 266 tons of steel for three girder bridges to be built at Attica, Ind., and Toledo, Ohio, from the American Bridge Co.

SUPPLY TRADE NEWS

PERSONAL

WILLIAM P. HARPER, chief of the purchasing department of the Allis-Chalmers Manufacturing Company and president of the Northwestern Manufacturing Company, Milwaukee, died of apoplexy on May 27.

JAMES A. NOLAN has accepted a position as superintendent of the track tool department of the Oliver Plow Company, Hamilton, Ontario. For several years he held a similar position with Hubbard & Co., Pittsburgh, Pa.

R. E. WILLIAMS, formerly auditor of the International & Great Northern and the Texas & Pacific, has joined the railway sales department of the Patton Paint Co., Milwaukee, Wis., and, in conjunction with W. E. Kelley, will have charge of the business of the Patton Paint Co. in the Southwest.

W. A. PHILLIS has been appointed advertising manager of the Borden Company, Warren, Ohio, in charge of the publicity and advertising of Beaver square-end pipe cutters and easy-working die stocks. Mr. Phillis was previously connected with the metallurgical and advertising department of the National Tube Company, Pittsburgh, Pa.

CHARLES A. GROSS, formerly assistant sales manager, structural steel department, of the Bethlehem Steel Company at New York, has resigned to join the Harris-Silvers-Baker Company, New York, engaged in the fabrication and erection of steel structures, which company is being reorganized. It is understood that Mr. Gross will be secretary of the new company.

JAMES T. HALL, president of the National Surface Guard Company, Chicago, died at that city on May 18, aged 81. He was born at Newport, Herkimer County, New York, in February, 1835, and when a young man engaged in the lumber business at St. Louis, Mich., and Alma. Later he was superintendent of the Chicago, Saginaw & Canada, now a part of the Pere Marquette, and when the Toledo, Ann Arbor & Northern was being built from St. Louis north about 40 miles, he had charge of the construction work. Twenty-seven years ago he went to Chicago, where he invented the first steel cattle guard and organized the National Surface Guard Company, becoming president. He held this position from that date until the time of his death as noted above.

JAMES T. HALL

WARD B. PERLEY has been elected vice-president and general manager of the Canadian Steel Corporation, a subsidiary of the United States Steel Corporation, organized to build the new Canadian works at Ojibiway, Ont. The first announcement that the steel corporation would build a Canadian works was made several years ago, but the announcement of the new corporation indicates that work will be begun at once on the new plant. Mr. Perley has long been identified with the steel industry, beginning work with the Franklin Iron Works Company at Columbus, Ohio. In 1899, when the National Steel Company was formed, he was made assistant to the vice-president in charge of the operating department. He became connected with the Steel Corporation in 1901, and in 1911 became assistant to the president, having charge of the distribution of raw materials other than iron, ore and coke, which position he held until his recent appointment.

P. J. FORD, for years buyer and department manager for Crerar, Adams & Company, Chicago, has organized the P. J. Ford Company, with office and store at 619-621 West Washington street, Chicago, which company has the selling agency for the Ford Chain Block and Manufacturing Company, Philadelphia, the Indiana Foundry Company, Indiana, Penn., and several heavy hardware specialties in the railroad supply field. Mr. Ford has had many years' experience in the railway supply field, having entered the employ of Crerar, Adams & Company on June 26, 1893, as an assistant shipping clerk, from which position he advanced to shipping clerk, city buyer and buyer and department manager of that company.

GENERAL

THE CEMENT-GUN CONSTRUCTION COMPANY, Chicago, has taken larger offices in the Karpen building, 900 South Michigan avenue.

THE TEXAS STEEL COMPANY, Beaumont, Tex., has been incorporated in Texas for $2,500,000. A suitable site for a steel plant has been secured at Beaumont and the iron ores of Cass, Marion and Upshur counties of that state will be used.

DAVID LUPTON'S SONS COMPANY, Philadelphia, Pa., manufacturers of special construction for light and ventilation in fireproof buildings, has opened a direct sales office at 1150 Oliver building, 141 Milk street, Boston, Mass., with Harry Wolf in charge as sales engineer. H. R. Wilkinson, the company's New York manager, now has general supervision of New England sales, and the direct Lupton service is extended through New England.

THE AMERICAN MANGANESE STEEL COMPANY, Chicago, has announced the purchase of the Brylgon Steel Casting Company's plant at New Castle, Del., which is a large, up-to-date steel foundry having a monthly capacity of approximately 400 tons of steel castings. This plant is rapidly being converted into a manganese steel foundry and is expected to be in operation by July 15. The American Manganese Steel Company now has two plants at New Castle, Del., and one at Chicago Heights, Ill.

THE FRANKLIN INSTITUTE has awarded its Elliott Cresson gold model to Dr. Robert Gans of Pankow, near Berlin, Germany, for Permutit, which is a gray colored, flaky substance, prepared by fusing together alumina, silica and an alkali carbonate, and is used for softening water. When the Permutit has been exhausted of its sodium, it may be regenerated with a solution of sodium chloride (common salt). The Permutit filters are widely used in Germany and France and are coming into use in England and the United States.

THE A. M. BYERS COMPANY, Pittsburgh, manufacturer of genuine wrought iron pipe, has leased for a term of years the plant of the Susquehanna Iron Company at Columbia, Pa., comprising the Columbia works and the Susquehanna works. The Susquehanna works consist of a puddle mill with 32 single furnaces and equipment of squeezers and muck bar mill, and the Columbia mill contains a puddling plant of 28 single furnaces and an 18-in. and a 10-in. skelp mill. Forge iron for these puddling plants will be furnished from the Byers blast furnace at Girard, Ohio.

CHARLES R. SHEPLEY AND WILLIAM L. JOHNSON have formed the firm of Shepley & Johnson, general contractors and engineers, with offices in the Pioneer building, St. Paul, Minn. Mr. Shepley was formerly chief engineer of the George J. Grant Construction Company of St. Paul and of the Emerson-Brantinghan Company. Mr. Johnson is vice-president and general manager of the American Dump Car Company of St. Paul, having formerly been associated with the Winston Bros. Company, railway contractors, of Minneapolis, and for the past three years having been a member of the firm of Hoy & Johnson of St. Paul.

THE RAILROAD WATER AND COAL HANDLING COMPANY, Chicago, Ill., has been awarded contracts by the Illinois Central for water station improvements at Effingham, Ill., and Kentwood, La. At Effingham the work includes the installation of 4,800 ft. of 6-in. pipe line and 50 ft. of 4-in. pipe line with valves and hydrants, and the building of the foundation for a water tank. The improvements at Kentwood include a 10,000-gal. fuel oil tank, 100 ft. of 8-in. pipe line, 100 ft. of 12-in. pipe line and the construction of a brick pump house 20 ft. by 28 ft., to contain 2 complete pumping units, each consisting of a Morris centrifugal pump with a capacity of 500 gal. per minute and a 25 hp. Stover fuel oil engine.

AT THE ANNUAL MEETING of the directors of Fairbanks, Morse & Co., Chicago, C. H. Morse, Sr., was elected chairman of the board and C. H. Morse, Jr., was re-elected president. The following have been elected directors of E. & T. Fairbanks & Co., St. Johnsbury, Vt., recently acquired by Fairbanks, Morse & Co.: C. H. Morse, Jr., W. E. Miller and W. S. Hovey of Chicago, Thomas McMillan of Montreal, H. J. Fuller of New York, succeeding Henry C. Ide, Charles A. B. Pratt of New York and Joseph Fairbanks, A. H. McLeod and C. L. Harpham of St. Johnsbury, Vt. Officers were elected as follows: Frank H. Brooks, president; C. H. Morse, Jr., vice-president; John C. Clark, secretary, and Fred C. Beck, treasurer.

AFTER A DECLINE in the use and production of natural cement to a point where it has become an almost negligible factor in masonry construction, one of the oldest companies, the Utica Hydraulic Cement Company of Utica, Ill., is now making a campaign to re-establish a legitimate place among construction materials for this product. The natural cement industry enjoyed an extended and steady growth until about 20 years ago, when the rapid development of the manufacture of Portland cement in this country, combined with a steady decline in the price of that material, effected a competition with which the natural cement manufacturers were unable to cope. The older material suffered also from the failures of natural cement structures in which its use had been ill-advised, combined with the coincident existence of a wide-spread educational campaign on the proper use of Portland cement, no equivalent of which was attempted by the natural cement manufacturers. Natural cement was in extensive use at a time when concrete construction was in its infancy and the improper practices in design and construction which were common at the time reacted to the disadvantage of natural cement. On the other hand, the subsequent investigations of concrete and the wide-spread discussion of design and construction have been contemporaneous with the growth of the Portland cement industry, which has profited materially therefrom. It is the object of the campaign now under way to show the extent to which natural cement has been used successfully for certain purposes, as in the mortar for brick sewers and other brick and masonry construction, in the concrete bases for pavements, in foundations and other places where it is not exposed to the atmosphere. Attention is also being called to the relative economy of natural and Portland cement for those purposes where natural cement has a legitimate place.

TRADE PUBLICATIONS

PRESSED STEEL CONSTRUCTION.—The Trussed Concrete Steel Company, Youngstown, Ohio, has issued a 24-page booklet describing Kahn pressed steel products for use in building construction. The booklet describes in detail the forms of construction for which these materials are applicable and their method of installation. A number of excellent photographs showing the use of these materials are also included.

BUMPING POSTS.—The Railway and Traction Supply Company, Chicago, has issued a 56-page catalogue illustrating installations of the Hercules steel bumping post, the Little Giant bumping post, the Weatherson nut lock and the Wyoming vacuum track sander. An interesting feature is the account of the special Hercules bumping posts installed on the Panama Canal locks for the towing locomotives.

PAINT.—The Sherwin-Williams Company, Cleveland, O., has issued an interesting booklet of 52 pages in commemoration of the company's fiftieth year of business, compiled as a record of the important events in the company's history. It contains articles by many of the officers of the company and is illustrated wtih photographs of the officers and of the plants at various stages.

PIPE CUTTERS.—The Borden Company, Warren, Ohio, has just issued a 16-page booklet concerning its die stocks and square-end pipe cutters. These tools are described in detail with unusually clear illustrations, giving a comprehensive idea of their construction and operation.